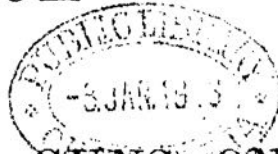


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HANDBOOK
OF THE
Q.F. 4.7-INCH B GUNS ON
TRAVELLING CARRIAGES.



LAND SERVICE.

1910.



LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
By MACKIE AND CO., LTD.,
WARRINGTON AND LONDON.

And to be purchased, either directly or through any Bookseller, from
WYMAN AND SONS, LTD., FETTER LANE, E.C.; or
OLIVER AND BOYD, TWEEDDALE COURT, EDINBURGH; or
E. PONSONBY, 116, GRAFTON STREET, DUBLIN.

Price Ninepence.

AMENDMENT

TO

Handbook, Q.F. 4.7-inch B Guns on Travelling Carriages. 1910.

Page 13, after line 16, add:—

LIST OF LUBRICATING HOLES.

Fittings which are provided with Oil Holes for Lubricating Purposes.	No. of Holes.	Position of Holes.
Carrier	3	1 at bottom of hinge for bearing washer; 1 on step at right rear face for breech mechanism lever axis stud; 1 at left front of carrier for sliding block.
Carrier hinge bolt	1	On top.
Link actuating breech screw ...	1	On top of axis pin, accessible with breech mechanism lever partially turned to the unlocked position.
Breech ring	1	To extractor bolt at right side of gun.
Breech screw	1	At rear of taper portion of screw in line with and in front of "screw fixing breech screw."
Axis pin for link	1	Top of axis pin in outer end of sliding block.

Page 25, after line 3, add:—

LIST OF LUBRICATING HOLES.

Fittings which are provided with Oil Holes for Lubricating Purposes.	No. of Holes.		Position of Holes.
	Mark I.	Mark I convt'd.	
Bearing pivot handwheel, brake gear	—	1	On right side, near handwheel.
Bracket elevating gear	3	3	On top of trail, left side.
Lubricator, cradle	1	1	On top of cradle.
Transom, front	1	—	Centre of carriage near axle-tree.
Wheel hand, brake gear (2) each	1	—	1 on each side of carriage.
Wheel hand, brake gear	—	1	On right side of carriage.
Spade attachment—			
Bearing pawl { outer {	1	—	} On left side of carriage.
spindle { inner ...	—	1	
	—	1	Centre of carriage, near axletree.

NOTE.—In order to assist in identifying the position of the lubricating holes, the heads of the screws should be kept free from paint.

**AMENDMENT TO HANDBOOK FOR Q.F.
4.7-INCH B. GUNS, ON TRAVELLING
CARRIAGE, 1910.**

54 Page 43, line 2, under " Duties," after " properly filled," *add*:—
illery
476 " he will be careful to note if the gland of the hydraulic buffer is
leaking; if the gland leaks a serious accident may occur to the
equipment during firing owing to the loss of liquid from the
hydraulic buffer ;"

**Handbook of the Q.F. 4.7-inch B Guns on
Travelling Carriages. (Land Service, 1910.)**

AMENDMENTS.

Page 46, paragraph headed "Miss-fires."

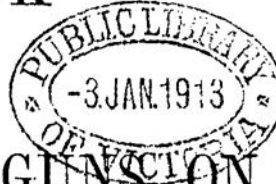
Line 3. *Delete* "one minute" and *substitute* "five minutes."

Line 5, same paragraph. *After* "when it is opened." *insert* "After
a further pause of one minute."

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HANDBOOK
OF THE
Q.F. 4·7-INCH B GUNS ON
TRAVELLING CARRIAGES.



LAND SERVICE.

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E. PONSONBY, 116, GRAFTON STREET, DUBLIN.

Price Ninepence.

[9d.]

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DIAGRAMS OF PACKING.

PLATES.

This handbook is corrected up to February, 1910. Any alterations which may be suggested should be sent to the Chief Inspector, Royal Arsenal, Woolwich.

✓

W. H. S.

HANDBOOK

OF THE

Q.F. 4·7-INCH "B" GUNS ON TRAVELLING CARRIAGES.

ORDNANCE, Q.F., 4·7-INCH, "B" MARKS I^o, II^o, III^o
AND IV^o.

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Marks I* to IV* guns.	<div> <div>Rifling Mark I</div> <div>† Rifling Mark II</div> </div>	Material	...	<div> <div>Marks I*, II* and III* steel.</div> <div>Mark IV* steel (wire construction).</div> </div>
		Weight	...	<div> <div> <div>of gun with fittings ...</div> <div> <div>Marks I*, II* and III* 41 cwt.</div> <div>Mark IV* 42 cwt.</div> </div> </div> <div> <div>of breech fittings { 4·7-inch B, Marks I* to IV* ... 1 cwt.</div> </div> </div>
		Length, total	... ..	<div> <div>Marks I* to IV* 194·1 inches.</div> </div>
		Bore	...	<div> <div>calibre Marks I* to IV* 4·724 inches.</div> <div>length (to face of breech screw) .. Marks I* to IV* 189 inches=40 calibres.</div> </div>
			...	<div> <div>system polygroove, E.O.C. section.</div> <div>length 170·6 inches.</div> </div>
			...	<div> <div>increasing from 1 in 100 calibres at breech to 1 in 34·352 calibres at 6·65 inches from the muzzle, remainder uniform 1 in 34·352 calibres.</div> </div>
			...	<div> <div>number 22.</div> <div>width 0·5 of an inch.</div> <div>depth 0·04 of an inch.</div> </div>
			...	<div> <div>polygroove modified plain section.</div> <div>length 170·6 inches.</div> </div>
			...	<div> <div>straight from breech end of rifling to 142·656 inches from the muzzle, the remaining 142·656 inches increasing from 0 to 1 turn in 30 calibres at muzzle.</div> </div>
			...	<div> <div>number 22.</div> <div>width 0·45 of an inch.</div> <div>depth 0·04 of an inch.</div> </div>
Firing Mechanism, Marks I* to IV*				percussion.

† Guns of future manufacture, and existing guns when re-tubed or through-lined, will be rifled with Mark II rifling.

(1038.) Wt. 33767—395 2,000 3/10. M. & Co.

GUN BODY MARK I^o.*(Plate I.)*

The gun is of steel and consists of the A tube, jacket, 1B, 2B, 3B, 4B, and 5B hoops, and breech ring. Over the rear portion of the A tube is shrunk the jacket, prolonged at the rear for the reception of the breech screw. The jacket is secured longitudinally by corresponding shoulders and a screwed steel ring at the front end. Immediately in front of the jacket are shrunk the 1B, 2B, 3B, 4B, and 5B hoops extending to the muzzle. The breech ring is shrunk over the rear end of the jacket.

GUN BODY MARK II^o.*(Plate I.)*

The gun is of steel and consists of the A tube, B hoop, C hoop, 1B and 2B tubes, and breech ring. Over the rear portion of the A tube is shrunk the jacket, prolonged at the rear for the reception of the breech screw. Immediately in front of the jacket is shrunk the B hoop, the jacket and B hoop being secured longitudinally by corresponding shoulders, and the C hoop which is shrunk over a portion of the B hoop and screwed to the jacket. The 1B and 2B tubes are shrunk round the A tube in front of the B hoop extending to the muzzle, and are secured longitudinally by corresponding shoulders, and by the 1B tube being screwed to the B hoop, and the 2B tube screwed to the 1B tube, respectively. The breech ring is shrunk over the rear end of the jacket.

GUN BODY MARK III^o.*(Plate II.)*

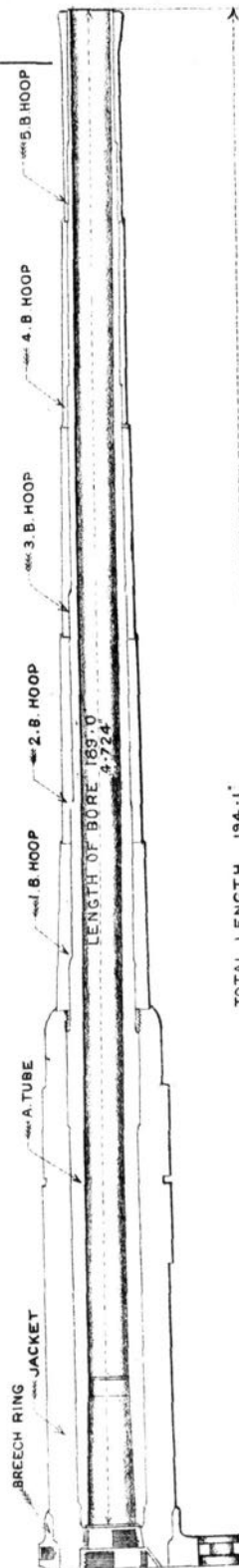
The gun is of steel, and consists of the A tube, B hoop, C hoop, 1B and 2B tubes, and breech ring. Over the rear portion of the A tube is shrunk the jacket, prolonged at the rear for the reception of the breech screw, and secured longitudinally by corresponding shoulders, and a screwed steel ring at the front end. The B hoop is shrunk round the A tube immediately in front of the jacket and is secured longitudinally by corresponding shoulders, and the C hoop which is shrunk over a portion of the B hoop and screwed to the jacket. The 1B and 2B tubes are shrunk round the A tube in front of the B hoop, extending to the muzzle. The 1B tube is secured longitudinally by corresponding shoulders on the A tube and by corresponding serrations on the A tube and B hoop, the latter overlapping the 1B tube at the joint. The 2B tube is secured in a similar manner to the A tube and 1B tube. The breech ring is shrunk over the rear end of the jacket.

GUN BODY MARK IV^o.*(Plate II.)*

The gun is of steel, and consists of the A tube, a series of layers of steel wire, jacket, breech bush, B tube, C hoop, and breech ring. Over the rear portion of the A tube are wound successive layers of steel wire, the ends of which are secured to steel rings.

ORDNANCE Q.F. 4.7 INCH, MARK I*

— SCALE = $\frac{1}{24}$ —



ORDNANCE Q.F. 4.7 INCH, MARK II*

— SCALE = $\frac{1}{24}$ —

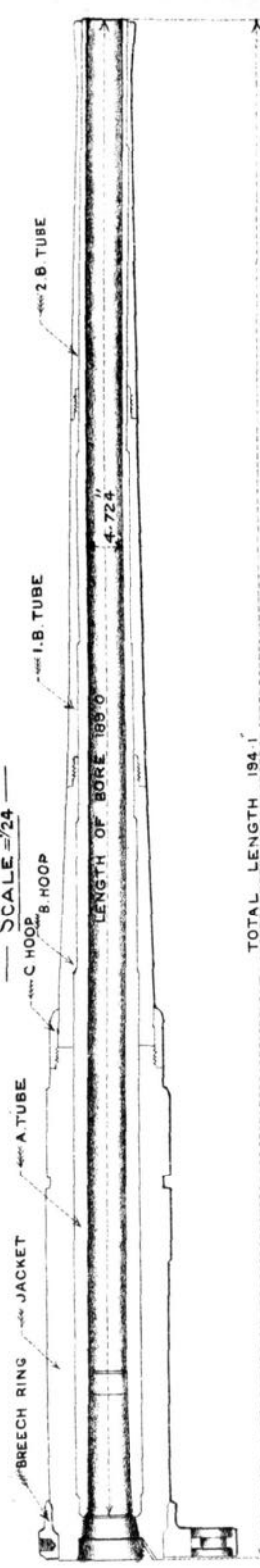
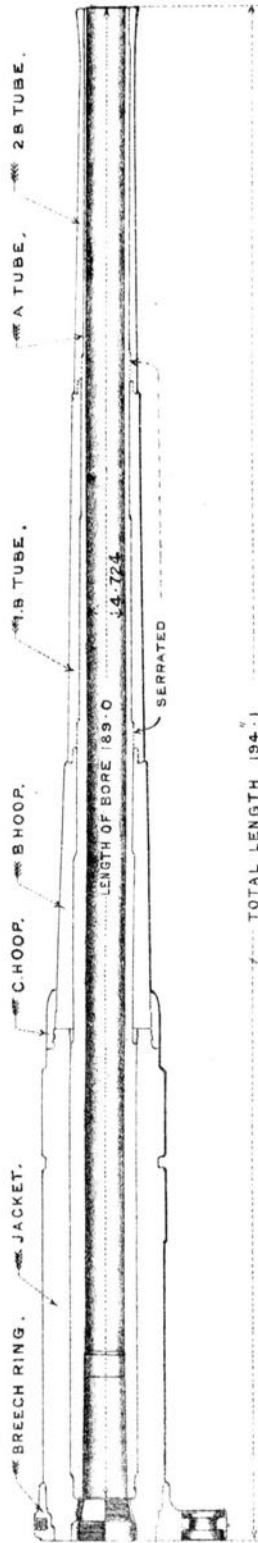


Plate I

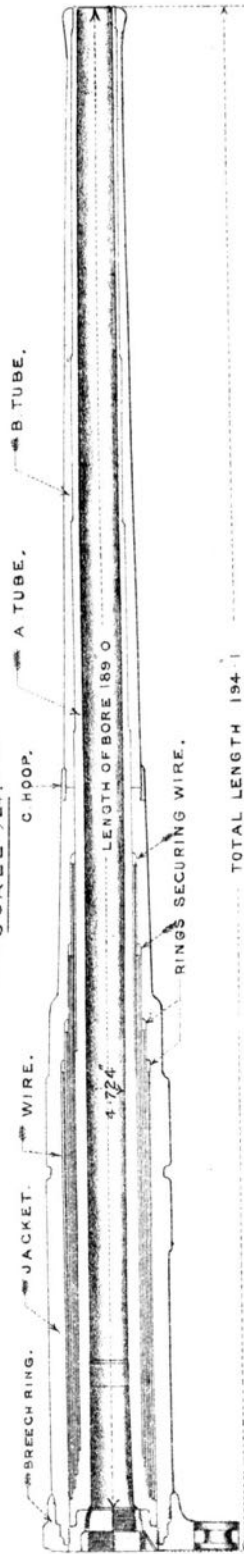
ORDNANCE, Q.F. 4.7 INCH, MARK III*

— SCALE $\frac{1}{24}$. —



ORDNANCE, Q.F. 4.7 INCH MARK IV.*

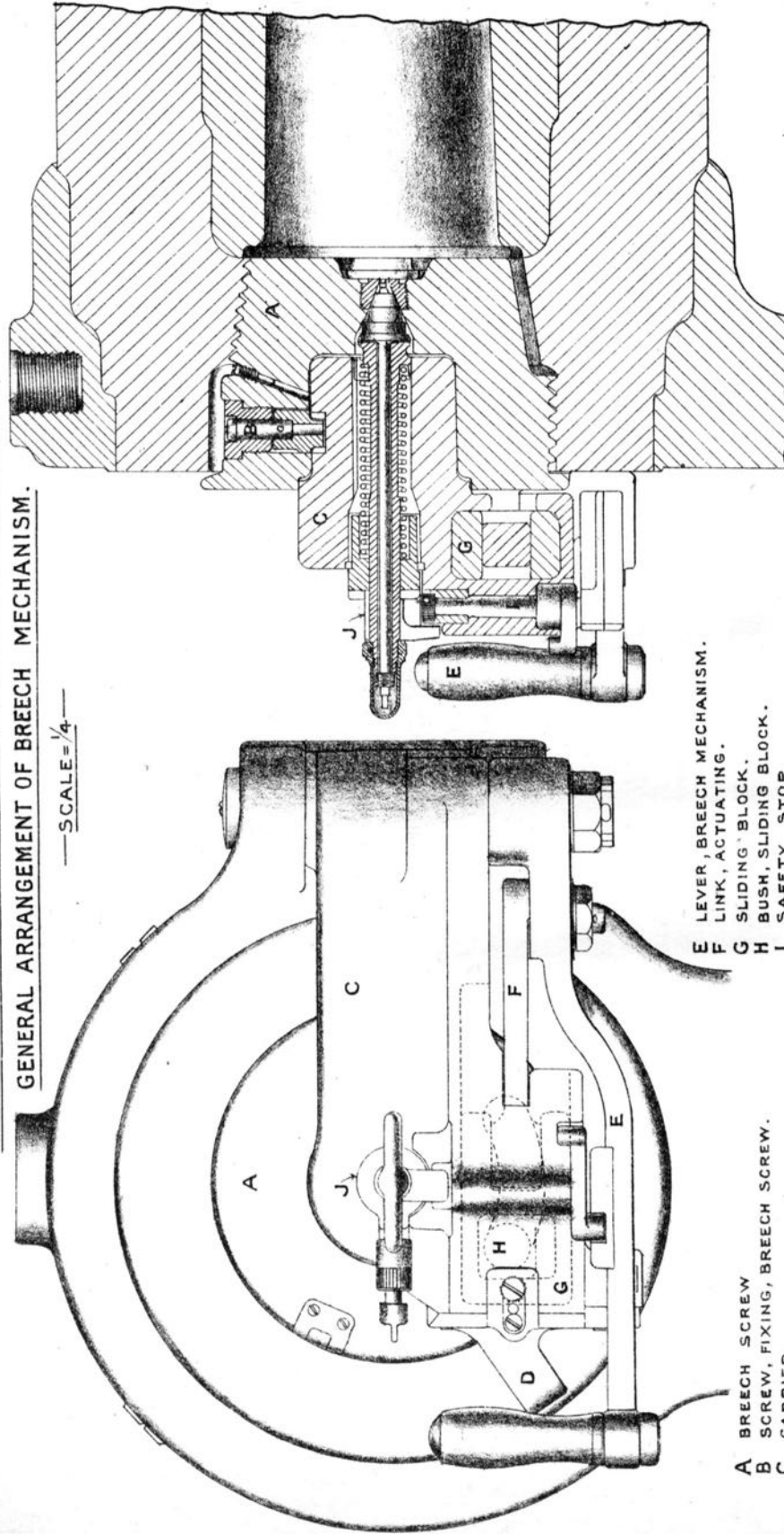
— SCALE $\frac{1}{24}$. —



ORDNANCE, Q.F. 4.7 INCH, "B," MARKS I* TO IV*

GENERAL ARRANGEMENT OF BREECH MECHANISM.

—SCALE=1/4—



E LEVER, BREECH MECHANISM.
F LINK, ACTUATING.
G SLIDING BLOCK.
H BUSH, SLIDING BLOCK.
I SAFETY STOP.
J STRIKER.

A BREECH SCREW
B SCREW, FIXING, BREECH SCREW.
C CARRIER.
D CATCH, RETAINING, BREECH SCREW.

The jacket is fitted and shrunk over the exterior of the wire, and a portion of the A tube, respectively, and is secured longitudinally by a screwed steel bush at the rear. The breech bush is screwed into the A tube and jacket, and is prepared for the reception of the breech screw. The B tube is shrunk over the A tube immediately in front of the jacket extending to the muzzle, and is secured longitudinally by corresponding shoulders and the C hoop which is screwed over portions of the B tube and jacket. The breech ring is shrunk and screwed over the rear end of the jacket.

GUN BODIES MARKS I³, II*, III³ and IV⁹.

(*Plates I and II.*)

Lugs are formed on the right and lower sides of the breech ring for the attachment of the breech mechanism of the gun, and the hydraulic buffer of the carriage, respectively. The lug on the lower side of the ring is recessed to suit the "block, adjusting buffer" belonging to the travelling carriage. The upper side of the breech ring is prepared for the reception of an eye bolt for lifting the gun, and is fitted for the reception of the "brackets, connecting, spring rods" of the travelling carriage. Preserving screws are provided for the holes for eyebolt, and fixing screws.

The exterior of the jacket is furnished with two longitudinal projections on the upper and lower sides respectively, forming guides for the gun when in the cradle.

The chamber is slightly coned throughout its length, to facilitate the insertion and extraction of the cartridge.

Two planes for clinometer are prepared on the upper surface of the jacket, the original plane, over which the Royal monogram is cut, being in front of the guide projection. The other plane for use when the gun is in the travelling carriage is immediately in front of the breech ring.

Axis lines are cut on the face of the muzzle and of the breech.

The actual weight of the gun is engraved on the top of the jacket in front of the breech ring.

The nature, mark, registered number, manufacturers' initials, and year of manufacture, are engraved on the upper portion of the breech face.

BREECH MECHANISM.

(*Plate III.*)

The mechanism is so arranged that by one pull on a lever the breech screw is automatically unlocked, withdrawn and swung clear for loading. After loading, one thrust on the same lever inserts the breech screw and turns it home; at the same time the striker is retained in a position of safety until the breech screw is securely locked and the actuating lever home. This motion is effected by means of a sliding block working in the lower part of the carrier, attached by a short link to the lever, which is pivoted on the carrier.

When this lever is pulled the link moves the sliding block, and this acting on a stud fixed to the breech screw, turns the latter, which is then withdrawn by the sustained pull on the lever.

The names of the principal parts of the breech mechanism are shown on Plate III.

DESCRIPTION OF BREECH MECHANISM.

Breech screw.—The breech of the gun is closed by a steel screw, cylindrical in form at the rear end, but tapered in front to give the necessary clearance to admit of the screw being swung direct from the unlocked to the loading position or *vice-versa*.

The parallel and conical parts of the breech screw have three portions of the thread removed longitudinally, the divisions in relief on the conical portion being opposite the plain portions of the parallel part, for the purpose of distributing the strain. The breech opening of the gun being prepared in a corresponding manner admits of the screw, when the raised portions are placed opposite the smooth surfaces in the gun, being swung home and locked by the sixth of a turn. The screw is prepared to receive the projecting portion of the carrier and striker.

To prevent injury to the screw threads of the breech screw and breech opening by the rapid and frequent closing of the breech, the leading edges of the threads are rounded off.

The rear face of the breech screw is fitted with a hard steel piece, having a recess to engage with the "catch retaining breech screw."

Upon the rear face is formed a stud to engage with the gunmetal bush of the sliding block.

Carrier.—When the breech screw is withdrawn from the gun, it is supported by means of a bronze carrier, hinged to the right side of the breech ring, and working upon a bearing washer.

Upon the front of the carrier is a large cylindrical projection, forming a pivot for the breech screw, which is secured thereon by the fixing screw (u), the inner end of the screw works in a groove lined with hard steel, and is arranged so as to admit of the breech screw being revolved in opening or closing the breech.

Inside the above projection a recess is prepared to receive the striker, and interrupted thrust collars are formed at the rear end to engage with those on the striker retaining nut.

The lower part of the carrier is recessed to receive the sliding block and link; the metal in front is also cut away to enable the stud of the breech screw to engage in the gunmetal bush of the sliding block.

On the front of the carrier hinge at the top, an eccentric is formed for actuating the extractor.

A recess is formed in the rear of the carrier for the reception of the safety stop.

A flat spring, fitted to the underside of the carrier, engages with the breech mechanism lever, in the closed position, and prevents any movement of the lever during firing.

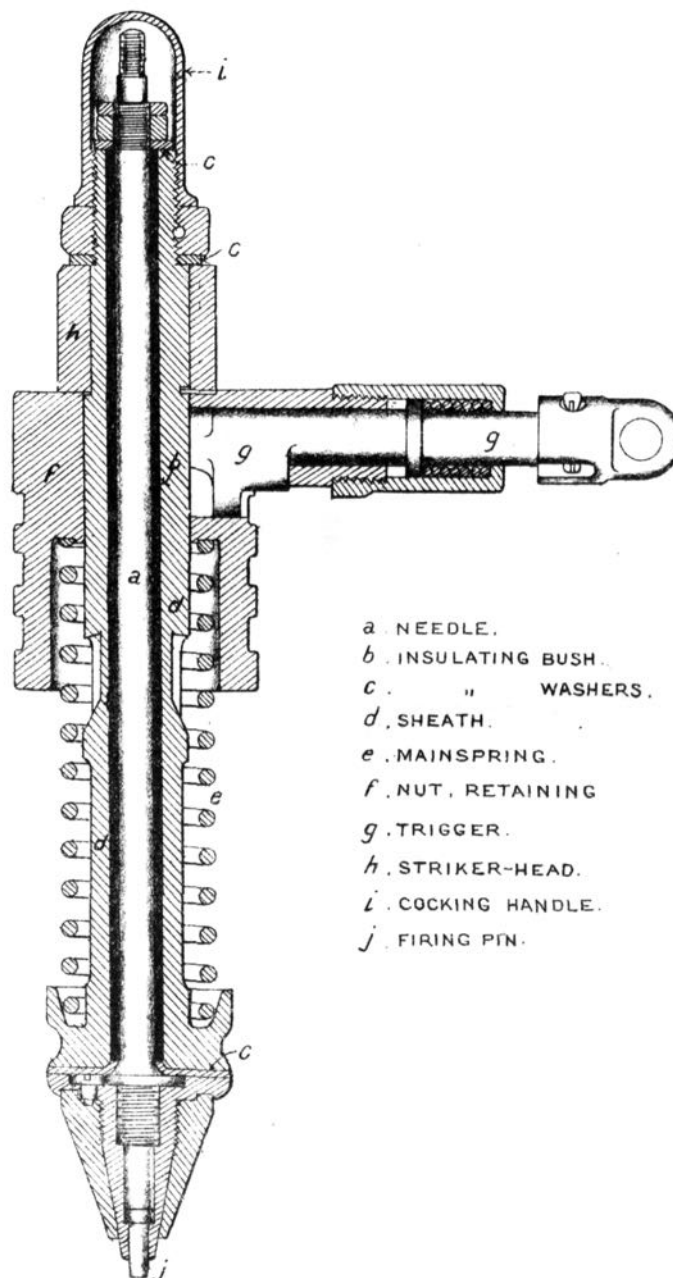
A steel stud is fixed to the underside of the carrier for the attachment of the breech mechanism lever.

ORDNANCE, Q.F. 4.7 INCH, "B", MARK I TO IV.*

STRIKER, ELECTRIC AND PERCUSSION.

(WITH COCKING HANDLE.)

SCALE - $\frac{3}{4}$.



- a. NEEDLE.
- b. INSULATING BUSH.
- c. " WASHERS.
- d. SHEATH.
- e. MAINSPRING.
- f. NUT, RETAINING
- g. TRIGGER.
- h. STRIKER-HEAD.
- i. COCKING HANDLE.
- j. FIRING PIN.

Catch, retaining breech screw.—To the left side of the carrier is fitted a gunmetal bracket which carries the retaining catch.

The catch consists of a steel lever pivoted in the bracket, and pressed forward by a spiral spring. The inner end of the catch is shaped to engage in the slot in the rear face of the breech screw, and a projection is formed on its front which bears against the face of the breech to force the inner end of the catch to the rear and automatically release the breech screw when closing the breech.

Lever, breech mechanism.—The breech mechanism lever is of steel, with a brass handle; it is mounted on a steel stud underneath the carrier, and secured by a castellated nut with keep pin; it is prepared for the attachment of the link, and upon the upper surface of the lever is fitted a plate of hard steel with an eccentric groove to engage the lower stud on the turning lever of the safety stop.

Link.—The link (F) is of steel; one end is pivoted on the breech mechanism lever, whilst the opposite end is attached to the sliding block.

Sliding block.—The sliding block (G) is of steel, rectangular in form; its right side is prepared for the attachment of the link (F); the opposite end is recessed to receive a gunmetal bush which engages the stud of the breech screw. The bush has vertical play, to enable it to conform to the motion of the stud of the breech screw in turning. A groove is cut along the underside of the block for the reception of the stud on the upper surface of the turning lever of the safety stop.

Extractor.—Mark IV^s (except Nos. 831 to 851 inclusive) and Marks I^o, II^o and III^o repaired with new "A" tube or chamber liner. The extractor consists of a steel bolt projecting through the side of the gun at the breech, having a shoulder cut on the inner end which engages the rim of the cartridge case when in the gun. The bolt is secured in position by a retaining nut screwed into the exterior of the gun. Fitted to the outer end of the extractor bolt is a buffer bracket with an actuating plate, actuated automatically by an eccentric formed on the upper portion of the carrier hinge, when the screw is swung into the loading position, thus partially revolving the bolt and releasing the cartridge case. A spiral spring in the buffer bracket serves to force the extractor bolt into its original position while the breech is being closed.

Marks I^o, II^o, III^o and IV^o guns, Nos. 831 to 851 inclusive, except those which have been repaired with new "A" tube or chamber liner, have the extractor bolt fitted from the interior of the gun and secured by means of a filling piece and two fixing screws in the chamber.

FIRING MECHANISM.

The gun is fired by percussion, through the agency of a striker which is fitted in the projecting arm of the carrier.

The firing mechanism is so arranged as to prevent the gun being fired until the breech is fully closed, the breech mechanism lever quite home, and the trigger of the striker pulled.

The names of the principal parts of the striker are shown on Plate IV.

DESCRIPTION OF STRIKER.

The strikers employed with these guns are the same as those employed with the guns in fixed armaments which are fired both electrically and percussively.

Needle.—Mark IV is the latest manufacture of needle, which consists of the following parts:—Part I (spindle); Part II (head), short firing pin, insulator, keep screw and two nuts. The firing pin^o being removable can be renewed as may become necessary, and the insulator, which is of vulcanized fibre, is fitted round the needle head so as to prevent electrical connection between the needle and the breech screw (in guns that are fired electrically); earlier marks of needle have been brought up to this pattern and known as Marks I^o, II^o and III^o respectively,

Insulating bushes, and washers.—Surrounding the needle is an insulating bush of ebonite in two parts; a hard leather insulating washer intervenes between the head of the needle and the front of the sheath, whilst another leather washer (or in present manufacture, of vulcanized fibre) is placed between the rear end of the sheath and the needle nuts.

Sheath.—The sheath is of steel, bored out to receive the needle spindle and insulating bushes; externally at the front end it is enlarged to form a bearing for the needle head, and the mainspring; upon this enlargement are two small feathers to engage in a feather-way in the carrier. Two cock notches are formed in the sides of the sheath to engage the trigger in percussion firing. The rear end of the sheath is prepared for the attachment of the striker head, and cocking handle.

Mainspring.—The striker is actuated by means of a strong spiral spring placed over the sheath, it bears against the head of the sheath in front and the retaining nut in rear.

Nut, retaining, striker.—The striker retaining nut fits over the sheath in the rear of the mainspring. It is of steel and is provided with a circular hole at its centre, through which the sheath passes. Around the exterior of the nut, interrupted thrust collars are formed to engage with those in the carrier.

A projection on the left side of the nut is hollowed to receive the trigger, and is screwed for the attachment of the trigger cap.

Slots are cut in the top and bottom of the rear face of the nut to receive a projection on the front of the striker head by means of which the nut is locked in position.

Trigger.—The trigger, which is of hardened steel, consists of a short spindle, enlarged at its inner end, and so shaped as to form a sear to engage (in percussion firing) with the cock notch in the sheath. The trigger is kept up to its work by a spiral spring, and the outer end is provided with a loop for the attachment of the firing lanyard.

The trigger is held in position by a “cap, retaining” screwed over the projection of the “nut, retaining.” On the front face of the cap is formed a flat, which, bearing against the carrier when the striker is in position, prevents the cap from becoming unscrewed.

* Spare firing pins are left 0.03 inch long to compensate for wear in the mechanism, and to ensure maximum protrusion.

Striker, head.—The striker head is of steel and fits over the sheath in rear of the retaining nut. It is prevented from turning by means of a featherway engaging with a feather on the sheath, on its front is a projection which engages in one of the slots in the retaining nut to prevent the nut revolving, and upon the underside is a lug which is engaged by the safety stop in opening the breech.

Assembling nut, and Cocking handle.—Behind the striker head is placed a leather washer, and in rear of this the assembling nut is screwed to the sheath, and further secured by means of a split keep pin. The cocking handle is screwed over the rear end of the sheath immediately behind the assembling nut.

SAFETY STOP.

A safety stop is fitted to the carrier to prevent the striker going forward and firing the gun until the breech screw is in the locked position, and the breech mechanism lever quite home. It consists of a steel spindle, at the lower end of which is a turning lever, having on its underside at one end a stud which gears in an eccentric groove in the breech mechanism lever. On the upper side of the turning lever at its opposite end is another stud, which, when the breech is opened, gears in a groove in the underside of the sliding block. The upper end of the stop is fitted with an eccentric lug which engages the lug on the head of the striker.

ACTION OF BREECH MECHANISM.

To open the breech.—On pulling the breech mechanism lever outwards and to the right the lever is disengaged from its catch retaining; the eccentric groove in the plate, on the lever engaging with the stud on the underside of the turning lever of the safety stop, causes the latter to revolve, and the eccentric lug at its upper end, bearing against a projection on the head of the striker, forces the latter to the rear, clear of the tube and forms a safety arrangement.

During the foregoing movement the stud on the upper side of the turning lever of the safety stop is revolved into the entrance of its groove in the underside of the sliding block, which in the further opening of the breech moves over the stud, and prevents any movement of the safety stop until the breech is again fully closed.

On the further movement of the lever, the actuating link together with the sliding block, gunmetal bush, and stud of breech screw are drawn to the right until the sliding block is checked by coming into contact with a shoulder forming the end of the recess in which it works, thereby forming a stop when the breech screw reaches the unlocked position.

During this movement the breech screw is caused to revolve to the withdrawing position by reason of the stud on its rear face, gearing into the gunmetal bush, which being capable of slight vertical movement, conforms to the arc described by the stud of the screw in turning.

When in the withdrawing position, the recess in the rear face of the breech screw comes opposite to, and is engaged by, the "catch retaining breech screw," which retains the breech screw in the correct position ready for closing.

The further movement of the breech mechanism lever causes the carrier and breech screw to swing together to the loading position. During the latter part of this movement, the eccentric on the front of the carrier hinge, pressing against the actuating plate of the extractor, causes its lever and extractor spindle to be partly revolved and the cartridge case started to the rear ready for removal by the "hand extractor."

To close the breech.—The action of closing the breech is the converse of the above.

To fire the gun.—Cock the striker by placing the loops of the cocking lanyard over the lugs of the cocking handle and pulling the striker to the rear until the cock notch in the sheath is engaged and retained by the trigger. The trigger is withdrawn and the striker released by a pull on the firing lanyard.

The gun can be fired from the right or left; in the former case, the striker retaining nut after being inserted in the carrier is revolved through a quarter of a circle to the right, until the trigger is horizontal, in the latter case it is revolved in the opposite direction.

SAFETY ARRANGEMENTS.

The breech must be fully closed and the lever breech mechanism quite home, because, until then, the safety stop will prevent the striker going sufficiently forward to reach the V.S. percussion tube in the adaptor.

PROTRUSION OF STRIKER.

In order to prevent premature contact between the needle of the striker and the V.S. tube, the high limit of protrusion of the striker through the firing hole bush of the breech screw, with the striker in the firing position, will be 0.11 of an inch. And to ensure contact between them under similar conditions, and so prevent missfires, the low limit will be 0.09 of an inch. Full instructions regarding the method of gauging and adjusting the protrusion of the striker are given in "Regulations for Magazines and Care of War Matériel."

REMOVING AND REPLACING THE BREECH FITTINGS.

Before removing the fittings, the breech should be opened and the breech mechanism swung into the loading position.

Striker.—Pull back the striker until the projection on the front of the head of the striker is clear of the recess in the retaining nut, turn the nut one-fourth of a turn to the right or left; the striker can then be withdrawn.

Breech screw.—Unscrew the fixing screw in the breech screw and remove it; the breech screw can then be withdrawn from the carrier.

Safety stop.—Remove the locking plate and fixing screw from the upper side of the stop, and remove the upper portion; the lower part can be withdrawn from below.

Bracket catch, retaining, breech screw.—Remove the locking plate, also the fixing screws, and remove the bracket with catch.

Sliding block with bush.—Take out the fixing screw of the axis pin of the link “actuating,” and remove the axis pin; the sliding block and bush can then be withdrawn from the carrier.

Link actuating.—Remove the keep pin and nut of the link from the under side of the breech mechanism lever; the link can then be withdrawn.

Lever breech mechanism.—Remove the keep pin and nut from the stud; the lever can then be withdrawn.

Spring, retaining, breech mechanism lever.—Take out the fixing screw, and remove the spring.

Carrier.—Withdraw the keep pin, and remove the hinge bolt; the carrier, with bearing washer, can then be withdrawn.

Extractor.—Unscrew the cover and withdraw the spiral spring and buffer. Remove the keep pin of the actuating plate axis pin, and withdraw the axis pin and plate. Take out the fixing screw and remove the lever from the extractor bolt. (Remove the retaining nut of the extractor bolt, and withdraw the bolt from the gun, where the bolt is inserted from the exterior.) (Remove the fixing screws of the filling piece and withdraw the extractor bolt and filling piece from the gun where the bolt is inserted from the interior.)

To dismantle the Striker.

To remove the trigger.—Unscrew the cap; the trigger can be then withdrawn from the striker.

To remove the needle.—Unscrew the cocking handle. Unscrew the nuts of the needle, and remove the nuts and leather washer. The needle, with leather washer, can then be withdrawn from the sheath.

To remove firing pin.—Take out the keep screw from under the head of the needle, when the latter can be unscrewed and removed; the firing pin can then be taken out.

To remove the main spring.—Remove the trigger and needle as described above. Unscrew the cocking handle, remove the keep pin of the assembling nut and unscrew the latter. Take off the washer, steel head, and retaining nut; the main spring can then be withdrawn.

To replace fittings.

The fittings are replaced in the reverse order.

NOTE.—All removable fittings should occasionally be taken entirely apart and examined in order to ascertain that they are quite sound and in good working order, any in which a crack is observed should be exchanged. They should also be examined frequently as to their condition in respect to wear in order that, if necessary, special examination may be called for.

The striker should be tested to see that the protrusion is correct.

APPURTENANCES, &c.

Bronze and steel drifts and a lead hammer are provided for removing and replacing the breech fittings.

Extractor, cartridge, hand, Q.F., small, land, Mark I (see page 32).

Gauge, striker, eccentricity, small.—The gauge is of brass, with a removable copper plug, for testing eccentricity of striker in guns using "P" vent-sealing tubes. The gauge is similar in contour and external dimensions to the "Tube, vent-sealing, electric, wireless." A recess is formed in the outer end of the gauge for the reception of a copper plug. Across the outer end of the gauge are engraved cross lines at right angles, one of the lines being marked with the maker's initials or trade mark.

Method of using the gauge.—Open the breech and insert the gauge in the adapter, care being taken to note the position of the maker's initials or trade mark on the outer end of the gauge. The breech will then be closed, the striker of the gun cocked, and released by pulling the trigger, when the indent of the point of the striker in the copper plug of the gauge will denote the amount and direction of eccentricity of the striker.

Gauge, striker, protrusion, No. 1.—This is of steel, for gauging the protrusion of the striker of the gun. Maximum protrusion, 0.11 inch; minimum, 0.09 inch.

Gauge, striker, withdrawn, Q.F. 4.7 inch "B" guns.—Is used to test the position of the point of the striker and to ensure that the front end of the firing pin in the needle is behind the face of the bush in the breech screw when the breech is open.

Rimer, vent, axial, short.—This is of bronze, and is used for clearing the tube seating in the cartridge adapter.

Wrenches.—The following wrenches are employed with the breech mechanism:—

Wrenches, breech mechanism—

No. 67	...	...	Striker.
„ 70	...	...	Nuts of axis pins breech mechanism, and all large screws.
„ 71	...	...	Extractor, and all small screws.
„ 78	...	...	Breech screw.

SIDE-ARMS, &c.

Cleaner, piassaba, Q.F. 4.7 inch travelling.—It is used for cleaning the bore of the gun.

The cleaner consists of a cylindrical piassaba brush to suit the bore of the gun.

It is fixed on the middle of a lanyard of sufficient length to admit of the cleaner, when in the gun, being pulled through the bore from either end. A lead ball is attached by white line to one end of the lanyard so as to carry it through the bore of the gun.

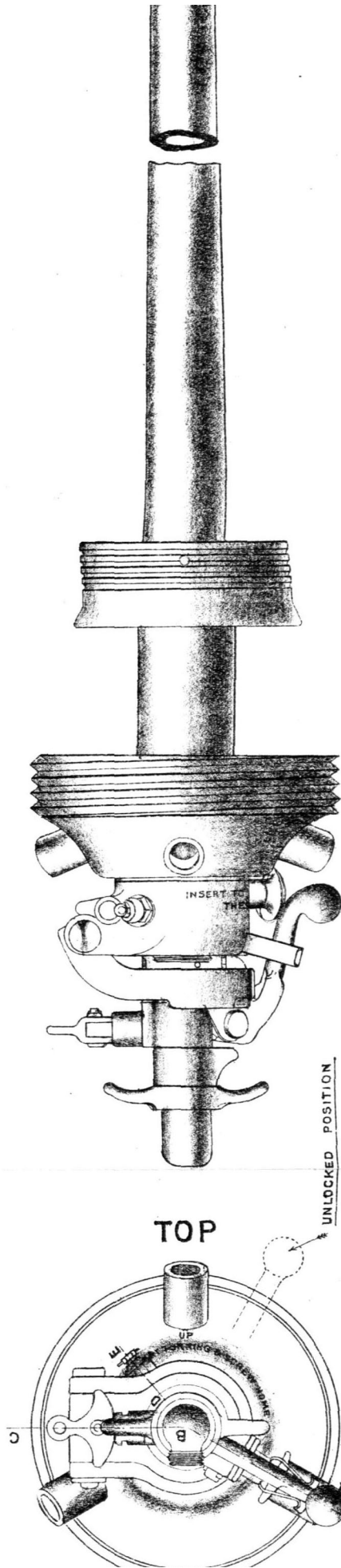
Case, cleaner, Q.F. 4.7 inch travelling.—The case is of water-proof canvas formed to hold the cleaner with lanyard, white line, and lead ball. It is provided with a leather strap 1 inch by 36 inches which is attached to the centre of the case for securing it to the carriage.

Cover, muzzle, No. 4.—This cover is made of water-proof canvas and is secured to the muzzle of the gun by a leather strap.

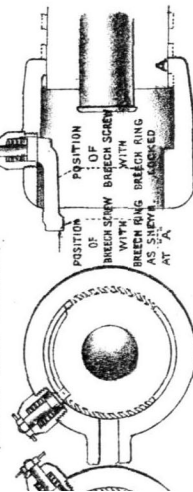
RIFLE, AIMING, 1-INCH, ELSWICK B Q.F. 4.7 INCH B MARKS I TO IV* GUNS, MARK II.

GENERAL ARRANGEMENT OF AIMING RIFLE IN GUN.

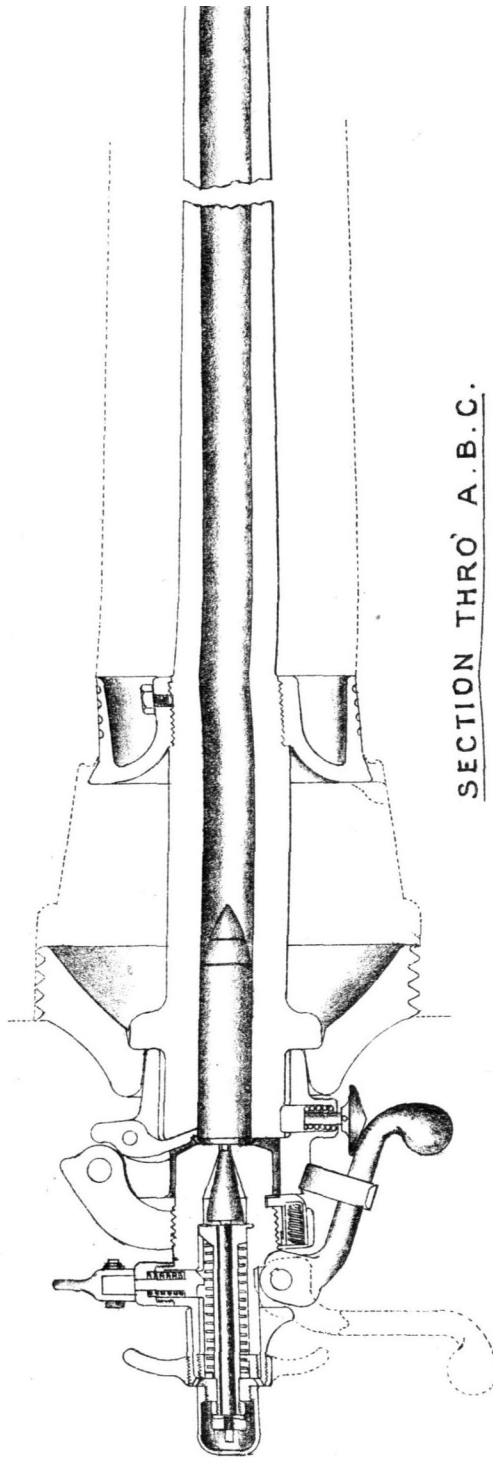
— SCALE = 1/4. —



D.E. SECTION THRO' D.E. (BREECH RING UNLOCKED) SECTION THRO' D.E. SHOWING SAFETY BOLT & BREECH RING



SECTION THRO' A.B.C.



Lanyard, cocking, No. 2.—The lanyard is of tarred white line 3 feet 8 inches long shortened locally to 34 inches, having at one end a wood toggle, the other end being formed into two loops which are placed over the two projecting lugs of the cocking handle on the striker. When the striker is in the cocked position, the toggle end of the lanyard is placed in a supporting clip provided for the purpose on the upper end of the carrier hinge bolt.

Lanyard, friction tube, siege, No. 2.—This lanyard is used for firing the gun and is also of tarred white line, 15 feet long with cylindrical wood toggle, hook, loop and auxiliary lanyard with hook.

Lanyard, firing, No. 7.—This lanyard will replace Lanyard, friction tube, siege, No. 2 for future issues, it is of tarred white line 8 feet 8 inches long, with toggle.

CARE AND PRESERVATION OF ORDNANCE AND FITTINGS, AND AIMING RIFLE.

See "*Regulations for Magazines and Care of War Matériel.*"

AIMING RIFLE.

The above is provided for imparting instruction in laying.
The following is a description of the rifle.

RIFLE, AIMING, 1-INCH, ELSWICK "B," (MARK II).

(Plate I.)

This apparatus, which is arranged for electric and percussion firing, but will only be used for percussion firing for these guns, contains its own firing mechanism (the breech mechanism of the gun is not used with it).

The principal parts of the rifle are as follows:—

- (a) Barrel.
- (b) Breech ring, with retaining catch, safety stop, extractor, and clip retaining cam lever.
- (c) Carrier, with hinge pin, and catch retaining breech screw.
- (d) Breech screw, with cam lever, cap for main spring, trigger, firing arc, and cap for trigger.
- (e) Sleeve withdrawing striker, with cocking handle.
- (f) Striker, consisting of needle, insulating bush, and washers, sheath, and mainspring.
- (g) Frame adjusting, front, with set screw.
- (h) Frame adjusting, rear.*

{	Mark I with interrupted screw thread, and two handles. Mark II with continuous screw thread, and two handles. Mark III with continuous screw thread, and three handles.
---	---

* Either of these marks may be on charge.

Description.

The 1-inch barrel is chambered and rifled on the Henry principle. It is prepared on the exterior at the rear, with interrupted thrust collars for the reception of the breech ring; the latter, which is prepared for the reception of the breech screw, is secured in position on the barrel by means of a spring catch, and is provided with lugs for the attachment of the breech mechanism of the aiming rifle. It is also fitted with a safety stop to prevent the breech being closed until the breech ring has been locked in position on the barrel. An extractor, which engages with the head of the cartridge in the rifle, is pivoted in the breech ring in such a manner, that when the breech is opened and the carrier swung into the loading position, the cartridge is automatically released.

The breech is closed by a parallel screw having two interruptions corresponding with the interior of the rear portion of the breech ring and is supported, when withdrawn, by a carrier hinged to the breech ring. The screw is attached to the carrier by screw threads on the rear end, which engage with corresponding screw threads in the carrier, and is worked by means of a cam lever.

A spring clip on the breech ring serves to retain the cam lever in the closed position.

The firing mechanism is designed for percussion firing.

Fitted to the outer face of the breech screw is a case enclosing a main spring through the centre of which the striker passes. The striker is provided with an insulated needle, the front end of which projects through the firing hole in the breech screw on firing and detonates the cap of the cartridge.

A withdrawing sleeve provided with a cocking handle is attached to the rear end of the striker, by means of which the striker is pulled into the cocked position, and retained by a trigger in the breech screw. A firing arc, having a loop for the attachment of the firing lanyard of the gun, is pivoted to the outer end of the trigger.

To prevent the rifle being fired before the breech screw is locked and cam lever home, a projection is provided on the withdrawing sleeve, which engages with the cam lever in such a manner that the first movement of the lever in opening the breech automatically withdraws the striker within the face of the breech screw.

Method of Fitting and Using the Apparatus.

The front adjusting frame is screwed over the barrel until the arrow on the top of frame and that on top of barrel coincide, and secured by means of the set screw.

The barrel with frame should then be placed in the breech opening of the gun, the part of the frame marked "TOP" being uppermost, the frame fitting in the rear end of the chamber of the gun. The Mark I rear adjusting frame is then placed over the rear end of the barrel, the part marked "TOP" being placed uppermost, pushed into the breech opening as far as it will go, and turned so as to engage with the screw threads of the breech opening. The frame should be jammed tightly into position in the breech of the gun, by means of the tommy, applied in one of the hollow handles, on the frame, and used as a lever. When correctly assembled the handles should be nearly horizontal.

In the event of the rear adjusting frame screwing beyond the position mentioned above, thin steel discs are provided, to be inserted over the rear end of the barrel, as may be necessary, the frame being temporarily removed for this purpose; and in order to prevent the liability of the frame to unscrew when firing, a filling piece of hard wood is fitted to one of the interruptions in the breech opening of the gun after the rear adjusting frame has been inserted.

When either Marks II or III rear adjusting frames are supplied, the method of fitting is as follows:—The barrel and front adjusting frame are inserted as before, the Mark II or III frame is placed over the end of the barrel, the part marked "UP" being uppermost, and turned so as to engage with the screw threads of the breech opening. The frame should be screwed tightly home by means of the tommy applied in one of the hollow handles on the frame and used as a lever.

Engraved upon the rear face of the frame is an indicator ring with the words "UP," "START TURNING AND SCREW HOME"; the indicator ring is flush with the rear face of the gun when in position.

The thin steel adjusting discs used with Mark I frame are not necessary when using either Marks II or III frames.

The breech ring with carrier and breech screw in the open position will then be placed over the rear end of the barrel, and revolved one-fourth of a turn, in such a direction as will admit of the retaining catch, in the breech ring engaging with the recess in the barrel for its reception. Indicator lines are engraved on the breech ring with instructions to facilitate assembling.

Care must be taken when removing the breech ring from the barrel to see that the breech screw and carrier of the rifle are always in the open position, and the extractor clear of the recess for its reception in the barrel.

Elevation is obtained by means of the carriage sights, and any error in line can be corrected by using the deflection scale.

The following appurtenances and implements are supplied for use with this rifle:—

Gauge Striker Protrusion, No. 3.—Is used for gauging the protrusion of striker of the rifle aiming Elswick "B," the maximum protrusion being 0.09 inch and minimum 0.07 inch. *Instructions for using the gauge are laid down in "Regulations for Magazines and Care of War Matériel."*

Extractor hand.—Is used to remove the empty cartridge case after it has been released by the extractor in opening the breech.

Tommy.—This is a cylindrical steel rod about 17 inches long, tapered at one end, which is inserted in one of the hollow handles of the rear adjusting frame, to give additional leverage in revolving it.

Wrench, aiming rifle, No. 9.—Is used for removing the striker case, small screws, and keep pins.

Wrench, aiming rifle, No. 10.—Is used for adjusting frames and all nuts.

Ammunition.

Cartridge, aiming rifle, 1-inch percussion.

CARRIAGE, TRAVELLING, Q.F. 4.7-INCH, MARK I.

(Plates VI. to VIII.)

The carriage consists of two side brackets, cradle with hydraulic buffer and running out springs, elevating, and brake gears, rocking bar sight, trail eye, spade attachment, axletree, and two wheels.

The side brackets are of steel plate, connected by top and bottom plates and transoms.

The gun recoils axially in the cradle, which is a casting of gun-metal with trunnions to pivot it to the trunnion bearings of the carriage. It is provided at the lower part with a hydraulic buffer to limit the recoil. The buffer (Plate VIII) consists of a steel cylinder stuffing box, gland, piston with rod, valve key, and controlling plunger. The cylinder is closed by the gland and stuffing box, the piston rod passes through the gland and is attached to a lug on the breech ring of the gun; the end of the rod is centred in the lug by an adjustable block. The valve key is fixed to the cylinder, and is so shaped that the flow of liquid is regulated to ensure an approximately constant pressure during recoil. The controlling plunger is fixed to the front end of the cylinder, so as to enter a hole in the piston rod, and by displacing the liquid therein contained, brings the gun gradually to rest when returning to the firing position. A small air hole passes through the right side of the cradle and buffer cylinder and is closed by a plug. A filling hole, also closed by a plug, is formed on the right side of the cradle. The quantity of liquid required for the buffer is about ten pints, part of which is contained in a tank formed at the right side of the cradle. The tank communicates with the buffer by means of a small hole, thus maintaining the full quantity of liquid in the buffer.

A cover of waterproof canvas, is provided to protect the stuffing box, gland, and piston rod of the hydraulic buffer. It is secured by three straps.

The cradle is fitted at the upper part with cylindrical cases (Plate VI), one on each side, containing running out springs, to return the gun to the firing position.

The springs are connected to a steel rod (A) which passes through the springs, and is fixed at the rear end to a bracket bolted to the breech ring of the gun. The forward end is provided with a screw thread and carries the metal nut (c) the flange of which forms a seating for the spring, at the other end the spring bears on the metal plate (D). The amount of initial compression is limited by the nuts (E) and (F) which are secured in position by split keep pins.

On firing, the rod (A) is drawn to the rear, thereby compressing the springs between the flanges of the nut (c) and the plate (D). The subsequent expansion of the springs causes the gun to return to the firing position.

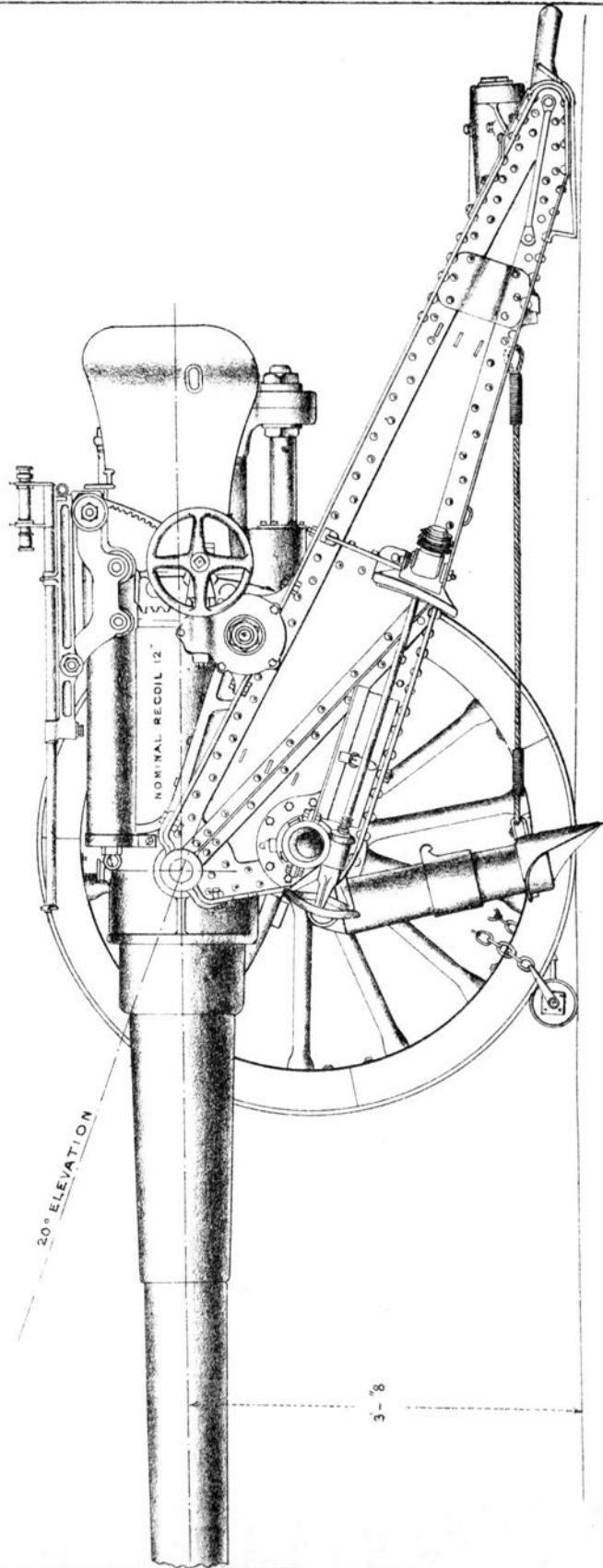
A sheet brass shield for protecting the gun layer is attached to the cradle on the left side. A hole is made in it through which the lanyard is passed for firing. In future manufacture the shield will be of steel and painted.

The elevating gear, which is attached to the left side of the carriage, is actuated by a handwheel which transmits motion through wormwheel gearing to an elevating arc which is attached by pivots to the rear of the cradle. The wormwheel is provided with a

CARRIAGE, TRAVELLING, Q.F. 4.7 INCH, MARK I.

SCALE = $\frac{1}{20}$

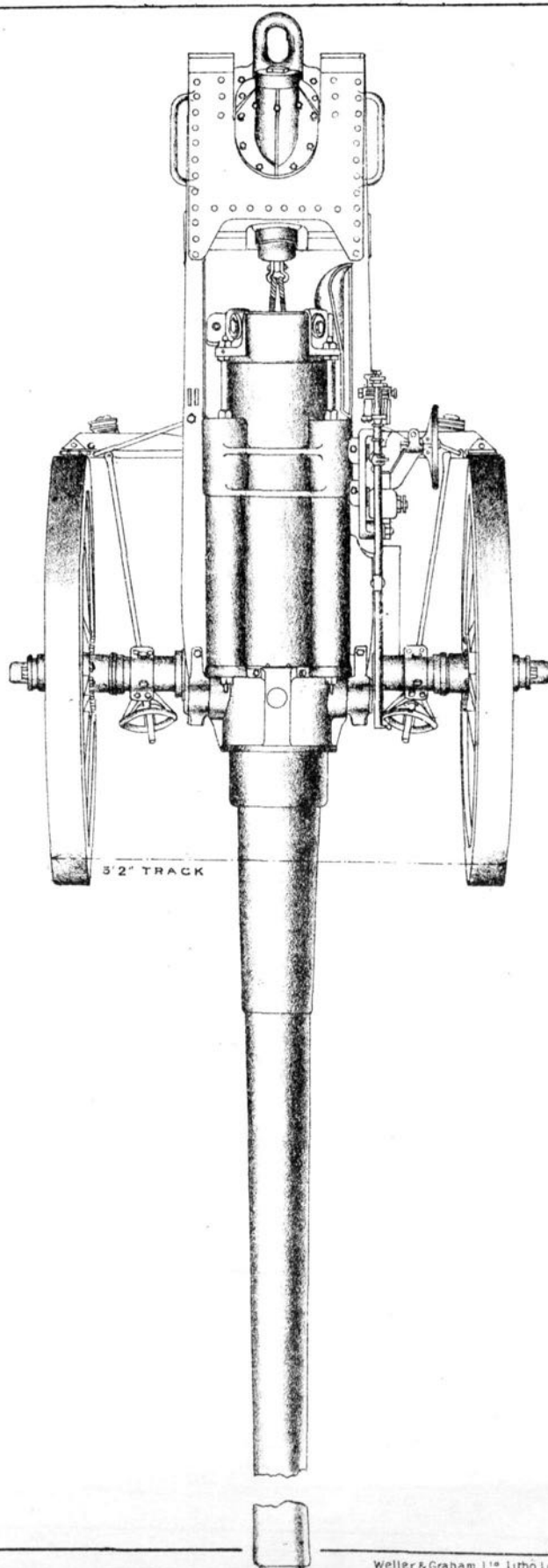
ELEVATION



CARRIAGE, TRAVELLING, Q.F. 4.7 INCH. MARK I.

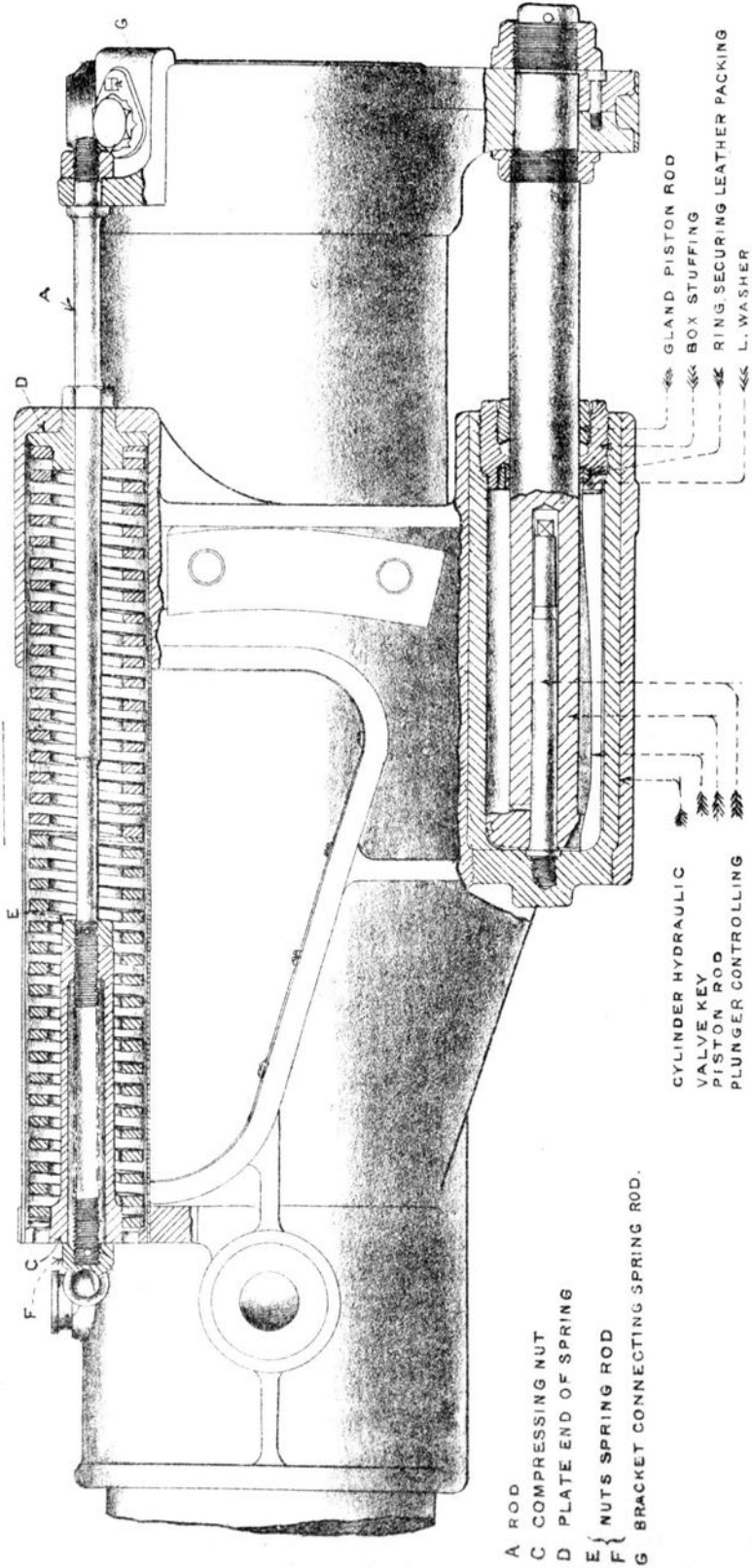
SCALE = $\frac{1}{24}$

PLAN



— CARRIAGE, TRAVELLING { Q.F. 4.7 INCH. CONVERTED, MARK I } —
 — SECTIONAL ELEVATION OF BUFFER & SPRINGS RUNNING OUT. —

SCALE = 1/8



friction clutch formed of alternate rings of steel and gun metal. The clutch is adjusted by means of nuts on the elevating pinion to produce the friction required to prevent the gun running down when at extreme recoil.

The sight is fitted to the left side of the cradle, and consists of a carrier, rocking bar, and sight bar. The carrier is attached to the cradle by means of adjusting bushes and screws. The rocking bar is pivoted to the carrier and carries the sight bar which is pivoted horizontally to it. Motion is transmitted to the sight bar by a steel arc actuated by a wormwheel. An angular (horizontal) movement of the sight bar for deflection is effected by means of a screw. A telescope is provided and fits on the rear end of the sight bar.

Three rings are provided for use with the yard scale drum, two for a full charge and one for the reduced charge. Provision is made in the limber box for carrying two of the rings.

A waterproof canvas cover is provided to protect the sights. It is secured by three straps.

The brake gear consists of two brake arms, each pivoted to the side brackets of the carriage. Each arm is actuated by a handwheel at the end of a rod working in a bracket attached to the axletree. At the end of each brake arm a shoe is provided to hold a cast iron brake block for checking the wheels.

The spade attachment consists of a spade-shaped toothed blade, suspended under the axle by a telescopic spring cylinder, which is hinged to the front transom. The blade is also attached by two steel wire ropes to a rear spring case passed diagonally between the sides of the trail and secured to a bracket fixed to the lower part of the trail.

When the gun is fired and the carriage recoils, the toothed blade catches in the ground, the carriage moving over the spade, the wire ropes drawing out the spring in the trail, and the shaft of the spade compressing the upright spring; after recoil the springs return the gun to the firing position.

The axletree, 1st class B, No. 12, is of tubular steel with 1st class arms. An adjusting collar and special linch pin will be required when using No. 10 wheels. By means of slots of varying depths in the collar (through which the linch pin passes) any reduction in the length of the pipe box, due to wear, may be adjusted.

The latest pattern of wheel approved for use with this carriage is the 1st class B, No. 10, which will eventually supersede the No. 9 wheel. The No. 10 wheel is of the double spoke type, 5 feet in diameter and has a manganese bronze nave with a removable pipe box, and a 6 inch tyre with rounded edges. The nave consists of two flanges which are connected by 14 bolts. The pipe box passes through the centre of the flanges and is secured by a small bolt to the inner flange. A bearing collar for the dragwasher and a dust cap are screwed to the outer end of the pipe, the cap being secured by 2 keep pins. A spanner, No. 189, is provided for use in removing the cap and adjusting the bearing collar for the drag washer.

A "roller, scotch, $4\frac{3}{4}$ inch" is attached to the carriage with chains for use in travelling. The Mark Ia pattern which has an outer chain $25\frac{1}{2}$ inches long, will be used with carriages having No. 10 wheels, and the Mark I, which has an outer chain 22 inches long, is for use with No. 9 wheels.

CARRIAGE, TRAVELLING, Q.F., 4·7-INCH, CONVERTED,
MARK I.

(Plate IX.)

This carriage is the R.M.L. 40-pr., converted to suit the Q.F. 4·7-inch gun, and consists of two side brackets forming the trail, cradle, elevating gear, brake gear, spade attachment, axletree (No. 7), trail eye, and wheels.

The cradle, elevating, sighting, and brake gears, spade attachment, and "roller scotch" are generally similar to those for the new carriage, described on pp. 16 and 17, except that the brake is applied from the right side of the carriage only.

A sighting step is attached to the trail on the left side.

Each side bracket is of plate iron, riveted to the inner side of an angle iron frame, and is provided with trunnion holes into which the trunnions of the cradle fit.

The axletree bed is of wrought iron, constituting with the axletree a beam of box girder section.

The wheels are 1st class "B," No. 6, 5 feet in diameter with 6-inch tire, which will eventually be superseded by No. 10 wheels as described on page 17.

List of stores carried on each carriage:—

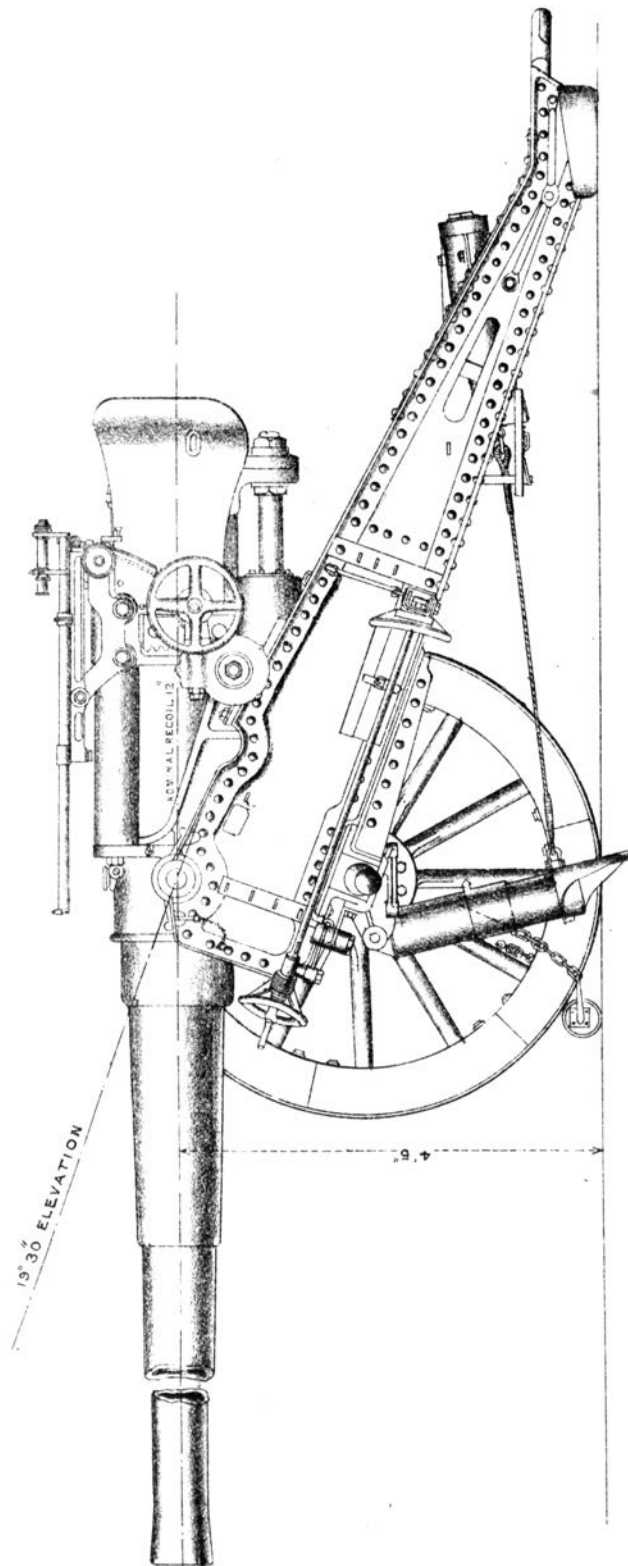
		New. Converted.		
Brush, breech screw...	...	1	1	In tool box, on left side.
Can, lubricating, No. 9	...	1	1	In housing block, between brackets of trail.
Cleaner, piasaba, No. 8 in case		1	1	On left brake arm.
Covers {	breech	...	1	Carried as convenient when not in position.
	buffer	...	1	
	muzzle, No. 4	...	1	
	sight...	...	1	
Hammer, claw, 28-oz. (or 32-oz.)		1	1	In tool box.
Handspikes, common, 6 feet		5	5	{ 3 on left side of trail. 2 on right side of trail.
Pincers, carpenter's, pairs	...	1	1	In tool box.
Posts, aiming	...	2	2	On top of trail, right side.
Rammer	...	...	1	Under carriage, left side.
			1	On left side.
Spanner, McMahon, 15-inch (or adjustable, 15-inch)	...	1°	1°	In tool box.
Spanner, No. 189	...	1§	1§	In tool box.

* 1 per carriage for Movable Armament and 1 per 2 carriages for Territorial Force.

§ 1 per 2 carriages when No. 10 wheels are used, Movable Armament.

CARRIAGE, TRAVELLING, Q F 4-7 INCH, CONVERTED MARK I.

SCALE = 1/24



TELESCOPE, SIGHTING, NO. 2.

MARK I.

Particulars.

Magnification	...	...	...	...	5 diameters
Field of view	...	...	...	...	5 degrees
Length over all	...	...	...	...	9.25-inches
Weight	...	...	...	...	1-lb. 13-oz.

Description.

The telescope is of the ordinary erecting type, with an object glass and terrestrial eye piece.

The body is fitted with two gunmetal collars which accurately fit the bearings on the sight bar.

An adjustable diaphragm carrying a needle pointer is fixed between the third and fourth lenses of the eye piece.

Two marks, one on the body, and the other on the focussing ring when approximated, show infinite focus.

The object glass is protected by a removable ray shade and shutter, and the eye piece is fitted with a dermatine eyeguard.

To focus the telescope.

First focus the pointer by screwing the eye piece in or out until the pointer is clearly defined, then focus the object *if necessary*, by revolving the milled ring at the object glass end. The focussing is correct when the eye can be moved to one side without the pointer going off the object.

Care of telescope.

The telescopes are issued with all cells, joints, &c., tightly screwed up. The glasses should not be unscrewed except in cases of necessity, and then only by a competent person; they will seldom require to be cleaned on the inside. Cleaning should only be done with chamois leather and great care must be taken that no oil or grease touches the glasses, as it can only be completely removed by the use of spirit.

If the object glass is unscrewed for cleaning purposes, the lenses should not be removed from the cell, as they may be easily reassembled incorrectly. The unscrewing of the object glass cell causes defective collimation, rendering the telescope useless, and necessitating re-collimation.

The focussing tubes should on no account be removed by any but a skilled person, specially appointed to do so.

The body of the telescope must not be cleaned or polished with anything except a dry cloth and a little oil or vaseline, care being taken that the lenses do not come in contact with any greasy substance. Even fingers, when apparently clean and dry, may leave greasy marks on the lenses which will impair the definition of the telescope more than dust.

General Remarks.

Telescopes as issued from Woolwich are tightly screwed up and accurately collimated, and provided that none of the screw threads are unscrewed or tampered with the collimation will remain as good as when first adjusted.

LIMBER, TRAVELLING, Q.F., 4·7-INCH, MARK I.

(Plate X.)

The limber consists of a steel frame and limber box mounted on a 2nd class axletree, and two wheels, a splinter bar, and two pairs of shafts.

The frame consists of four futchels, connected to the axletree at the rear and the splinter bar at the front. A footboard and a platform board are fitted to the top of the futchels; the limber hook (No. 21) is riveted to the two centre futchels and cross plate. Two outriggers for four horse draught and two loops for engine draught connector are attached to the front ends of the outer futchels.

The outriggers are fitted with a hook with loop so that No. 10A or 11 swingletree can be attached.

The shafts are one pair—near No. 1 and off No. 20A, and one pair framed, No. 16A.

The axletree, 2nd class C, No. 38, is of tubular steel.

The wheels are 2nd class "C," No. 35A, 5 feet in diameter, with steel nave, removable pipe box, and a 3-inch steel tire with rounded edges. The nave consists of two flanges of corrugated steel, which are connected by 14 bolts; the inner flange is fitted with a steel ring to strengthen it, and the outer flange with a metal centering ring; the pipe box is passed through the flanges, and is secured by a nut, which is prevented from working loose by a spring fixed to the pipe box.

LIMBER, TRAVELLING, Q.F., 4·7-INCH, CONVERTED,
MARK I.

This is the ordinary siege limber, with the limber box arranged internally to carry the stores of the Q.F., 4·7-inch gun.

It consists of three futchels and splinter bar arranged for engine draught, an axletree bed of wrought iron, which, with the axletree (No. 92), constitutes a beam of box girder section. The outriggers are fitted with a hook and loop to take the No. 10A or 11 swingletree.

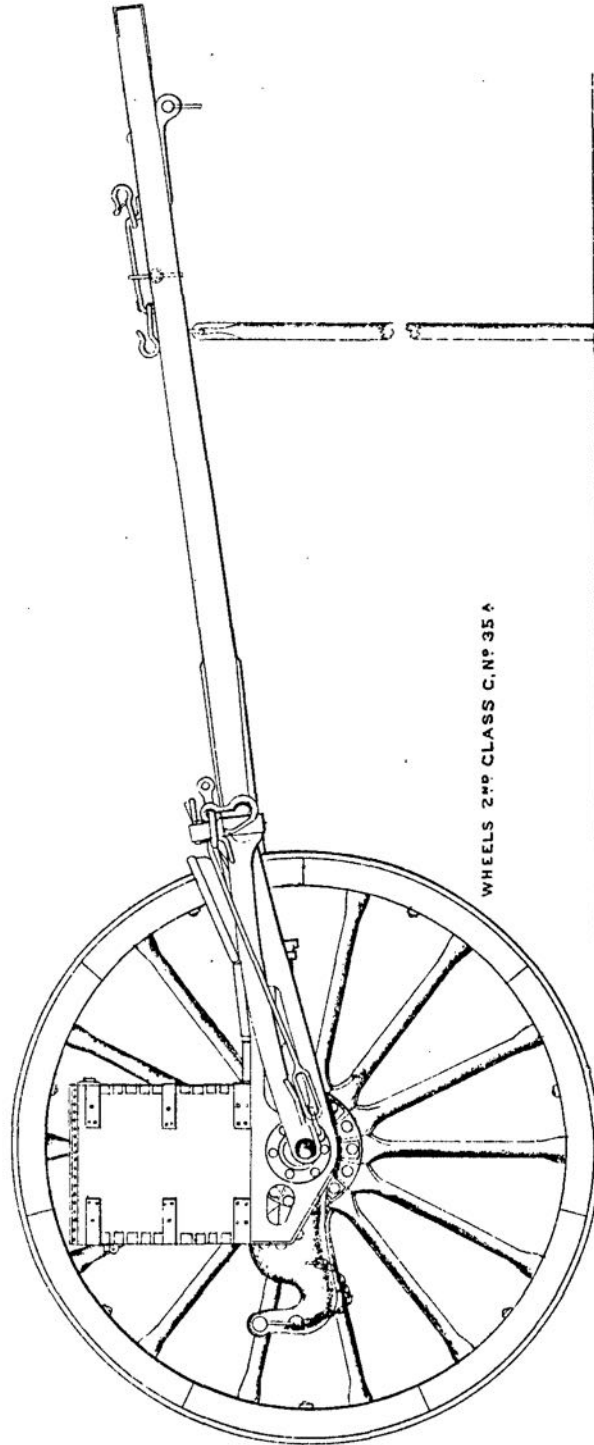
The limber hook is No. 14.

The wheels are 2nd Class "C," No. 39, 5 feet in diameter, double spoked, with a 3-inch tire and removable pipe box. The nave consists of two flanges, connected by 14 bolts; the pipe box passes through the flanges, and is secured to the inner flange by a $\frac{5}{8}$ -inch bolt with nut. A feather is fitted to the pipe box to engage with the inner flange, and so prevent the box from turning.

LIMBER, Q. F. 4.7 INCH MARK I.

SCALE = $\frac{1}{20}$

ELEVATION



WHEELS 2ND CLASS C. N° 35 A

The shafts are one pair—near No. 1 and off No. 20, and one pair framed, No. 16, but in future manufacture the framed shafts will be No. 16A, which are of a lighter pattern, having short pins for connecting to the splinter bar.

Each limber is fitted to carry the following stores (see Packing, Diagram A, p. 53) :—

	No.
Axes { felling, curved helve	1
{ pick	1
Box, grease, 3 lb., filled	1
Brush, water, carriage	1
Bucket, water, G.S., leather	2
Connector, engine draught No. 1	1
Hook, bill... ..	1
Jack, lifting screw, Clerk's	1 ^o
Key, lock, in pocket	1
Kettles, camp	2
Maul, G.S.	1†
Ropes, drag, heavy (pairs)	1
Shovels, G.S.	2
Saw, hand, 26-inch, in case	1
Swingletree, No. 10A or 11	(spare) 1

CONNECTORS, ENGINE DRAUGHT, NOS. 1 AND 2.

The No. 1 connector is V-shaped, formed with an eye at the apex for connecting to an engine, and with lugs at the forked ends for attachment to the loops on the futchels. When not in use it is carried strapped to the underside of the limber. The No. 2 connector is similar in shape to the No. 1 and is fitted with a draught bolt with a volute spring. The spring is retained between the apex of the V-shaped link and a bearing plate by two collar stays and the bolt which passes through the spring, link and bearing plate. An eye is formed at one end of the bolt for attachment to an engine. When not in use it will be carried in the G.S. wagon.

* { Movable Armament—1 per 2 pieces or less number.
 { Territorial Force—1 per 2 pieces.
 † Movable Armament only.

DIMENSIONS, &c.
CARRIAGES AND LIMBERS.

				New.		Converted.				
				ft.	ins.	ft.	ins.			
Height to axis of gun				3	8	4	5			
Length	of	carriage and limber	with shafts ...	31	7	32	6			
			without shafts	24	8	26	3			
		carriage... ..	with gun ...	20	7	21	0			
			without gun ...	10	9	11	9			
		limber	with shafts ...	11	4	12	0			
			without shafts	5	9	5	8			
axletree... ..	carriage ...	6	5	6	5					
	limber... ..	6	2	6	3½					
Length between axletrees (carriage and limber)...				9	1½	10	4½			
Greatest projection, limber (one side)				0	3½	0	1½			
Maximum width	...	carriage	6	5	6	5				
		limber	6	8½	6	8				
Wheels	track	carriage	5	2	5	2				
		limber	5	2	5	2				
	diameter	carriage	5	0	5	0				
		limber	5	0	5	0				
Angle of trail, carriage on ground				27°		20°				
Elevation, maximum				20°		20°				
Depression, "				6°		6°				
Weight	of	Cradle	10	0	0	10	0	0	
			
		carriage	with gun and cradle (with wheels and stores) ...	75	0	19	86	2	0	
			trail on ground	3	0	0	6	1	0	
		carriage and limber	on fore wheels	13	3	14	19	3	14	
			with gun and stores { " hind "	74	3	5	82	0	14	
		limber packed (with wheels)...	...	13	2	0	15	2	0	
			on shafts at point of harness attachment	1	1	16	1	1	0	
		wheels	{	1st class, "B," { No. 6	3	2	0	5	1	0
				" " { " 9	3	0	13	3	0	13
				" " { " 10	1	3	14	—	—	—
				2nd class, "C," { " 35A	—	—	—	2	1	5
		limber { " 39			88	2	19	102	0	0
complete equipment behind team ...				88	2	19	102	0	0	

BOX, LIMBER.

(Plate X.)

The box is of deal, with elm ends, and is secured to the limber by bolts. The overall dimensions are 4ft. 3ins. × 1ft. 7ins. × 1ft. 4ins.

It is internally arranged to carry the following stores (see also Diagram B., p. 54) :—

STORES CARRIED IN LIMBER BOX.

Articles.	Number.		Where carried.
	Movable Armament.	Territorial Force.	
Bar, sight	1c	1c	Long tray.
Blocks, brake	1a	2b	Under small tray.
Boxes {dubbing	1	1	" " "
{spare springs, &c.	1	1	Long tray.
Bush {firing hole	2a	1b	Large tray.
{sliding block	2a	1b	" "
Can, lubricating No. 10	1	1	" "
Capsquares {left	1a	1b	Under small tray.
{right	1a	1b	" " "
Chalk, white box	1	1	Small tray.
Clinometer, large, in case	1	1	Box, right hand.
Cloths, sponge	10	10	Under large tray.
Collars, adjusting, 1st class "B" capped wheels	1d	—	Under small tray.
Cordage, tarred, spun-yarn, hemp, 3 thread lbs.	2	1	Under large tray.
Drift, No. 7	1a	2b	Large tray.
Drift, No. 11	1a	2b	" "
Dubbing lbs.	1	—	In box, under small tray.
Extractor, cartridge, hand, Q.F., small	1	1	Large tray.
Eye, lifting No. 5	1	1	Under small tray.
File, second cut, half round 8-inch ...	1	1	Small tray.
Gauges, striker, eccentricity, {In small tin	1a	1b	} Small tray.
Plugs, copper box	25a	25b	
Gauge, striker {protrusion, No. 1 ...	4a	1	Large tray.
{withdrawn	4a	1	" " "
Hammer, lead	1a	2b	Under large tray.
Handle, file, small	1	1	Small tray.
Handbook, in waterproof bag	1	1	As convenient.
Holder, cartridge	1	1	Under large tray.
Insulators	8a	2	Long tray.
(fuze, universal	2	2	Small tray.
Keys, {inserting primer, or adapter	1	1	Large tray.
{removing do. do.	1	1	Long tray.
Key, locking releasing lever	1a	—	Large tray.
Knife, clasp	1	—	" "
Lanyards {friction tube, siege No. 2†	3	3	Under small tray.
{cocking, No. 2	1	1	" " "
Leathers, chamois	2a	1b	Long tray.
Lines {carpenters	1	—	Small tray.
{Hambro	1	1	Under large tray.
Marline, white lbs.	1	1	" " "
Marline spike, steel 11-inch	1a	2b	Under small tray.
Measure, hydraulic buffer filling, No. 1	1a	1b	Under large tray.
Oil, Rangoon pints	1a	$\frac{1}{2}$	In can.
Packing, hydraulic, $\frac{1}{2}$ -inch, length of 3 feet lengths	2	2	Under small tray.
{firing {long	1a	2b	Large tray.
{short	1a	2b	" "
keep, split	various	various	" "
Pins {1st class	1c	1c	Under small tray.
{linch {1st class "B" capped {wheels	1d	—	" " "
{2nd class	1	1	" " "

† Lanyard, firing, No. 7 for future issues.

STORES CARRIED IN LIMBER BOX—continued.

Articles.	Number		Where carried.
	Movable Armament.	Territorial Force.	
Plugs { air	1	1	Small tray.
{ filling hole, hydraulic buffer,			
{ No. 10	1	1	" "
Pocket, tube L.S.	1	1	Under small tray.
Reel, carpenter's line	1	—	Small tray.
Rimer, vent, axial short	1	1	" "
Rings, packing, hydraulic buffer	2	2	Long tray.
Rings, yard scale	2c	2c	Large tray.
Rod, rear spring	1a	1b	Under large tray.
{ fixing breech screw	1a	2b	Large tray.
{ preserving contact bracket	1f	1f	Under small tray.
{ preserving bracket con-			
{ necting spring rods	2f	2f	" " "
Screwdriver, G.S., 6-inch	1	1	Small tray.
Screwdriver, No. 10	1	1	Large tray.
Shackles, wire rope { large	1a	1b	Small tray.
{ small	2a	2b	" "
Spanners { No. 93	1k	1k	Under large tray.
{ " 94	1	1	" " "
{ " 190	1	1	Small tray.
{ " 210	1	1	Under large tray.
{ hydraulic buffer, No. 110	1	1	" " "
{ " " " No. 111	1	1	" " "
{ catch " retaining, breech			
{ screw	1a	2b	Large tray.
{ disc { No. 37	1	1	Under small tray.
{ " 53	2h	2h	" " "
{ " 35	2g	2g	" " "
{ extractor	1a	2b	Large tray.
{ main	1a	2b	" "
{ pawl, supporting spade	1a	1b	Small tray.
Strap, tube box, long	1	1	Under small tray.
Strikers, E. and P.	1	1	Large tray.
Tape, measuring 50 feet	4a	—	Small tray.
Telescope, sighting No. 2	1	1	Long tray.
Ties, lynch pin	10	10	Small tray.
Trigger	1a	2b	Large tray.
Twine, whipping lbs.	1	1b	Under large tray.
{ drag, 1st class "B," with loop	1c	1c	Under small tray.
{ drag, 1st class "B" capped			
{ wheels	1d	—	" " "
{ sheath, E. and P. striker...	1	1	Long tray.
Washers { large	1	1	" "
{ small	5	5	" "
{ loop, 2nd class "C"	1	1	Under small tray.
{ packing, leather (set of 3),			
{ cradle sets	2	2	Long tray.
Wrenches, { No. 78	1a	2b	Large tray.
{ breech " 70	1a	2b	Under large tray.
{ mechanism " 71	1a	2b	Large tray.
{ " 67	1a	2b	" "
Wrench, pivot, No. 12	1	1	Under large tray.

(a) Per group.

(b) Per battery.

(c) Component of sight, carried in
limber box when not in use.

(d) When No. 10 wheels are used.

(e) For No. 9 wheel.

(f) Components of gun, carried in
limber box when not in use.

(g) For converted carriages.

(h) For new carriages.

(k) For limbers having No. 35^A
wheels.

CARE AND PRESERVATION OF CARRIAGES.

See "Regulations for Magazines and Care of War Matériel."

SPECIAL INSTRUCTIONS NOT IN THE ABOVE-MENTIONED REGULATIONS.

Particular attention must be paid to the elevating gear to preserve it in good order. If taken apart, care must be taken, in replacing the parts, that the wormwheel is in the correct position, and that the friction rings are placed so that steel does not come against steel; also that the faces of the rings are free from burrs, &c. Care must be taken that the rings are tightened just sufficiently to give the necessary "slip" for preventing injury to the gear.

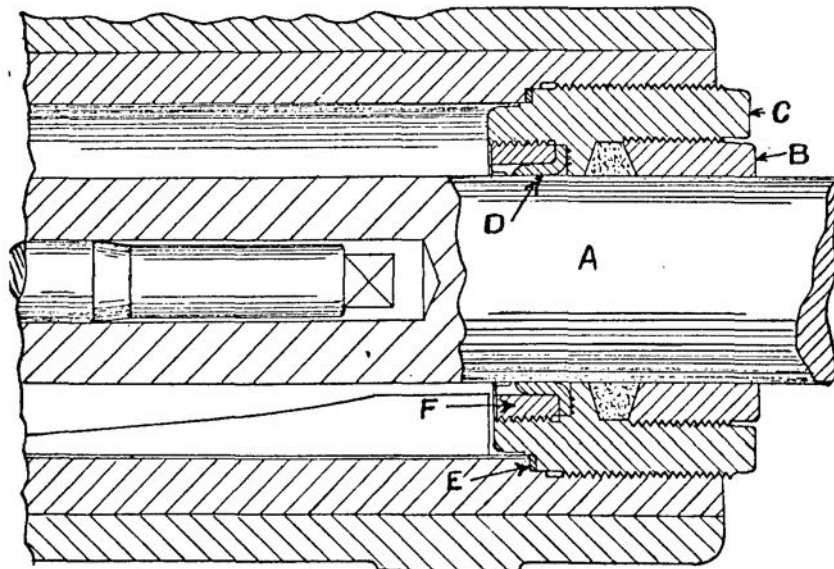
Hydraulic Buffer (Cradle).

The full complement of liquid must be maintained in the buffer, or damage will be done to the carriage when the gun is fired. Always before firing is carried out it should be seen that the piston rod nuts are properly connected.

If the buffer leaks at the gland, and tightening up the latter does not stop the leak, the packing must be renewed.

Spanners for removing the piston rod nuts, glands, and stuffing box, and new packing will be found in the limber box.

To replace packing of hydraulic buffer.—Slightly depress the cradle. Disconnect the gun from the piston rod and rods of the running out springs by removing the nuts. Force the gun back, with care, about 18 inches, which will afford space to work. *The gun must be temporarily secured in this position.* Withdraw the piston rod (A) a few inches, unscrew the gland (B) and remove the old packing. Clean out the stuffing box (C), slightly coat it and the piston rod (A) with mineral jelly. Pack stuffing box with new packing which consists of $\frac{1}{2}$ -inch hydraulic packing square section, 36 inches will be required, which will be cut into four lengths, each



length about equalling the circumference of the piston rod; the cuts will be made diagonally so as to overlap when the piece is formed into a ring. Well tallow each ring, press them successively into the stuffing box with a piece of wood or former, taking care that they are arranged so as to break joint. Screw home the gland, but not too tightly at first, which would prevent free action of the piston rod. The bright parts should be coated with mineral jelly and the gun connected up as previously.

*To replace L leather packing ring (D) or leather washer (E).—*Slightly depress the cradle. Disconnect the gun from the piston and running out rods, place and secure it in a convenient position, as before mentioned, to enable the stuffing box and gland to be removed from the piston rod. Unscrew the stuffing box and remove it from the piston rod. Care must be taken to catch the liquid in a clean vessel so that it can be returned to the cylinder when refilling. At the same time unscrew the filling hole plug above tank to assist the flow of the liquid from the tank. Unscrew the "ring securing leather packing" (F). Remove the unserviceable L leather of washer, and replace by new ones, which must be well dubbed before insertion. Replace the securing ring. Screw home the stuffing box, connect up the gun as before and fill the buffer as described below.

*To replace leather washer of tank plug.—*Unscrew the plug and catch the liquid in a clean vessel so that it may be returned to the tank when refilling. Substitute a new washer for the damaged one. Replace the plug and fill the tank at the filling hole. The leather washer of the filling hole plug can be replaced by simply removing the plug.

*Controlling plunger.—*In cases where it is found that the guns do not run fully up to the firing position, the flat surface on the controlling plunger must be adjusted by filing; too much metal must not be removed or the gun will run up with violence.

*To fill the buffer.—*Depress the cradle. Remove the filling hole plug and air plug which are on the right-hand side of the cradle the former being uppermost. Fill through the filling hole until the liquid overflows at the air hole. Replace the air plug. Continue pouring in the liquid until it overflows. Replace filling hole plug.

INSTRUCTIONS FOR TESTING AND ADJUSTING THE SIGHTS.

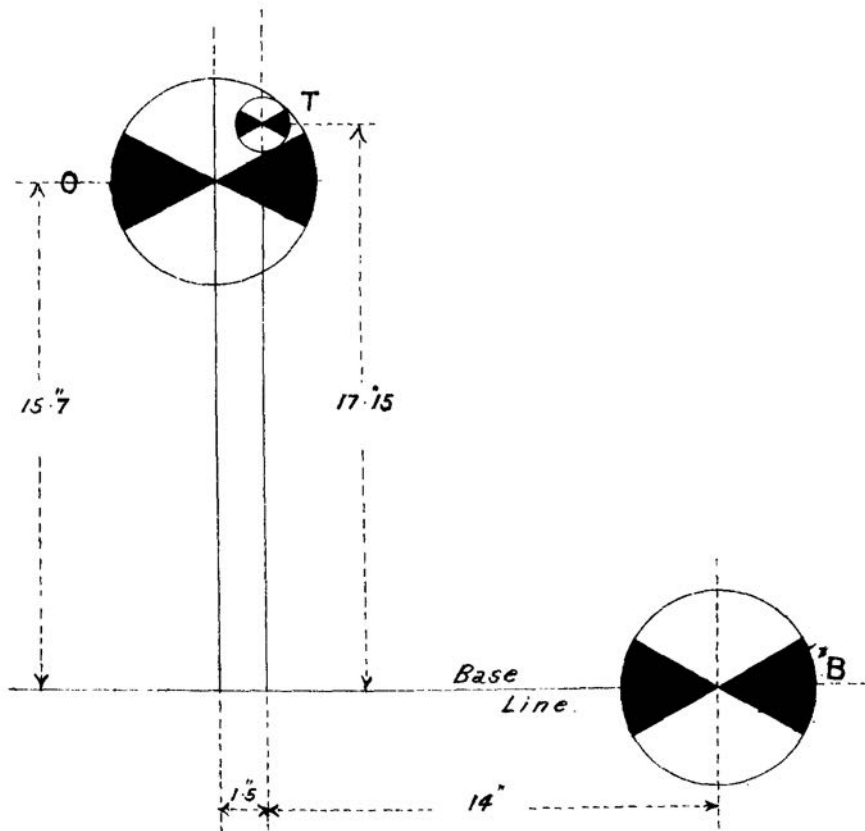
Any adjustment required must be carried out by an armament artificer.

Before any of the following operations are carried out, the carriage should be placed on a firm platform or on hard, level ground, and manipulated until the gun is approximately level both longitudinally and transversely.

The bearing faces of the sight carrier and cradle should be examined and any burrs carefully removed with a smooth file. The set screws for the adjusting bushes on the cradle should also be examined and screwed home if necessary.

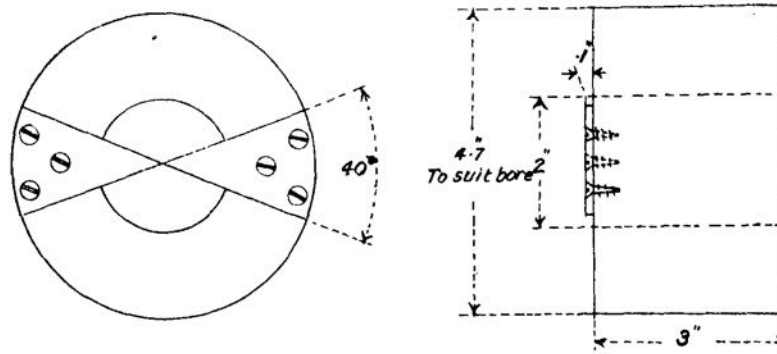
TARGET FOR TESTING SIGHTS OF 4.7 INCH Q.F.

SCALE = $\frac{1}{6}$.



BUSH TESTING SIGHTING, 4.7 Q.F.

SCALE = $\frac{1}{3}$.



1. *The yard scale ring should indicate Zero when the rocking bar is resting on its stop.*

Test.—Place carrier in position and secure it, firmly, to the face of the cradle with the two fixing screws. Move the rocking bar until it rests lightly on its stop. The yard scale ring should indicate Zero.

Adjustment.—Loosen the three small securing screws of the yard scale ring, and turn the ring, without moving the drum, until the Zero line coincides with the reader and tighten up the screws.

TELESCOPE.

2. *Collimation.*—*The optical axis of the telescope should be parallel to its mechanical axis.*

Test.—Place the telescope in the bearings on the sight bar. Lay the pointer (pointing upwards) on some well-defined object not less than 400 yards distant. Revolve the telescope slowly in its bearings through a complete circle. The tip of the pointer should remain exactly on the same spot.

Adjustment.—Unscrew the eyepiece as a whole, remove the screwed cover protecting diaphragm, and replace the eyepiece. If, when the telescope has been revolved half a turn, the tip of the pointer appears to move above or below the point laid on, unscrew the capstan headed screw immediately opposite, and screw up the other, until the pointer is brought half way towards the point laid on; lay the pointer (by means of the elevating gear of gun) upon the object and repeat process until the pointer moves neither above or below the point laid on.

If when the telescope is revolved the tip of the pointer appears to move to the right or left of the object, the error should be corrected in a similar manner to that just described for “above” or “below.”

Test again through a complete revolution.

See that all capstan headed screws are home, and replace the protecting cap.

ALIGNMENT.

In order to carry out the tests for alignment it is necessary to obtain a sight along the axis of the bore of the gun.

A point at the muzzle is obtained by stretching two fine cords along the vertical and horizontal axis lines on the muzzle of the gun, their point of intersection being on the axis line, or, a sighting bush (*see* Plate XI) may, for this purpose, be made locally.

The firing hole in the breech screw is used as a sighting hole at the breech end, the striker having been removed. By looking through the hole in the breech screw, and turning the disc, it can be ascertained that the pointers of the bush are in the central position.

Select a clearly defined object, at least a mile distant, to lay on, or if this is not available, construct a target as in Plate XI.

Set the target up at a distance of about 50 yards from the gun, with the base line horizontal.

Lay the axis of the gun on the point “B.”

ROCKING BAR SIGHT.

(a) *Direction* :—

Test.—Set the deflection scale at Zero. The pointer of telescope should fall on the same vertical line as the point "T," and the line of sight of *open sights* on "O."

Adjustment.—Turn the deflection screw until the pointer of the telescope falls on the same vertical line as the point "T." Loosen the screws fixing the deflection scale plate and adjust the plate until Zero line coincides with the index arrow on deflection leaf. Tighten the fixing screws.

(b) *Elevation* :—

Test.—Set the yard scale ring at Zero. The pointer of the telescope should fall on the same horizontal line as "T" and the line of sight of the *open sights* on the point "O."

Adjustment.—If the error is small (5 minutes or under) it should be noted, and no adjustment made.

If, however, the sights are found to be much out of adjustment it is probably due to the sight bar being bent, and the sight should be returned to Woolwich for adjustment.

If, however, it is absolutely necessary for the sight to be adjusted locally, proceed as follows:—

Remove the sight bar from the carrier. Revolve the sight bar in V shaped supports (wood blocks firmly fixed to a base would answer the purpose) to ascertain the position of the bend. Straighten the bar by means of a hammer and wood blocks.

Replace sight bar and repeat "(a)" adjustment.

GUN. AMMUNITION FOR Q.F. 4.7-INCH GUNS ON TRAVELLING CARRIAGES.

Description.	Projectiles.				Nature of Fuze.	Cartridge.		Means of Firing.
	Mark.	Weight filled and fuze.	Weight of bursting charge.	Maximum length of shell.		Nature.	Weight.	
Shell, common lyddite	I II III IV	lb. oz. 46 9	lb. oz. 7 5 7 5 6 10 + { 6 10 16 365 + { 16 65 13 71 13 71 13 71 12 96 left to contractor.	inches. 17-05 17-05 16-365 + { 16 65 13 71 13 71 13 71 12 96 left to contractor.	D.A. Impact No. 13 (for practice). D.A. with Cap No. 1 (for service). T. & P. No. 54* T. & P. No. 62† D.A. with Cap. No. 1	cordite	5 7	20 Adapter with V.S. percussion tube.
Shell, shrapnel	I II III IV	45 0	0 5 0 5 0 4½ 0 4½	13-71 13-71 13-71 12-96				
Shell, common, iron...	I	45 0	1 8			cordite Blank L.G. powder	2 5½ 3 0	7½ —

† Since February, 1903, the shells are to the latter figures.

* For practice up to 75 per cent. for guns in movable armament of stations abroad and for the defence of land fronts at home, also for equipment and practice of guns of Territorial Force.

‡ For equipment of guns in movable armament of stations abroad and for the defence of land fronts at home; also for practice purposes up to 25 per cent. (exclusive of guns with Territorial Forces).

RIFLE AIMING.

Description.	Mark of Cartridge.	Charge.		Means of Firing.
		Weight of bullet.	Weight.	
Cartridge, aiming rifle, 1 inch percussion ...	I	oz. 9 gr. 408	R. F. G.² powder grains 400	percussion cap

NOTE.—Items printed in italics are obsolescent.

CARTRIDGES, ETC.

CARTRIDGES, Q.F., 4·7-INCH, 5LB. 7OZ. CORDITE, SIZE 20.

(Plate XII.)

The *Mark VI* cartridge consists of a *Mark II* case, with adapter, cordite charge, igniter, cordite cylinder, wad, and lid.

The charge, consisting of 5lb. 7oz. cordite size 20, is secured in the form of a bundle, by shalloon braid in three places, the outer rings of cordite sticks being divided and tied in six equal bundles at the base of the charge so as to increase the diameter.

The igniter consists of a cylindrical shalloon bag containing $1\frac{1}{4}$ oz. of S.F.G.² powder†, and is stitched into a cordite cylinder 0·15 inch thick, which fits in the centre of the charge at the rear end.

Above the charge is placed a felt wad with a glazeboard disc stitched to the underside; these are finally held in position by a *Mark V*^o, *VI* or *VII* lid, the joint between the lid and case being sealed by "Pettman" cement.

Upon the top of the lid is attached a paper label showing the size of the cordite, the word "Cordite," the weight of the charge, the lot number of the cordite and the numeral of the filled cartridge. The numeral of the filled cartridge refers to the mode of filling *not* to the empty case.

The *Mark V* cartridge differs from the *Mark VI* in the cordite sticks being of different lengths and contained in a shalloon bag, the rear end of the cordite is not separately bundled and the igniter is of R.F.G.² new or converted powder. It has a *Mark III* lid.

In the *Mark IV*^o cartridge the charge is $\frac{1}{2}$ inch shorter than that for the *Mark V*, the space between it and the lid being filled with one or more felt wads.

The *Mark IV* cartridge is similar to *Mark IV*^o but has a paper cylinder instead of wads.

The *Mark III*^o is similar to the *Mark V* cartridge differing only in the charge being $\frac{1}{2}$ inch shorter, the space between charge and *Mark III* lid being filled up by one or more felt wads.

Mark II cartridges have an igniter consisting of $1\frac{1}{4}$ oz. of R.F.G.² powder contained in a paper cylinder which is screwed on to a *Mark II* adapter.

CARTRIDGE, Q.F. 4·7-INCH, 2LB. 5 $\frac{3}{4}$ OZ. CORDITE SIZE 7 $\frac{1}{2}$.

(Plate XIII.)

The *Mark III* cartridge consists of a *Mark II* case, with adapter, a cordite charge make up similar to the charge for the 5 lb. 7 oz. *Mark VI* cartridge, $1\frac{1}{4}$ oz. S.F.G.² powder igniter†, 0·05" cordite cylinder, *Mark II* paper cylinder, *Mark III* wad, and *Mark VII* lid.

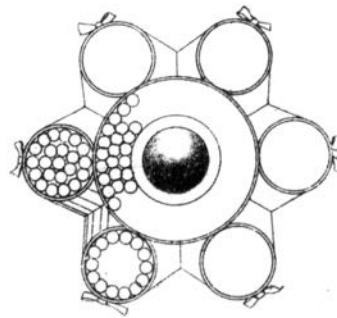
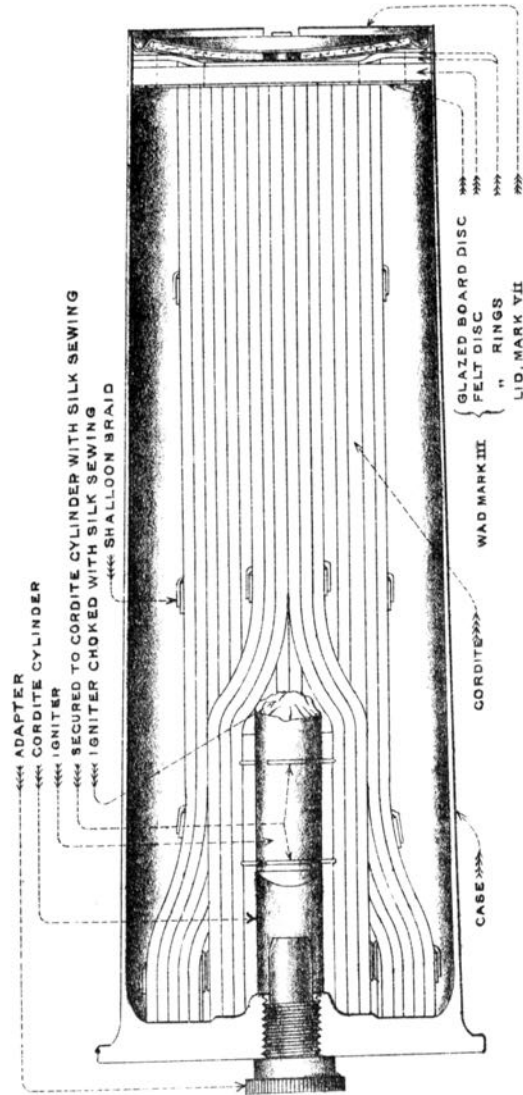
The *Mark II* cartridge differs only from the *Mark III* in having a longer paper cylinder (*Mark I*), no wad, and a *Mark V*^o or *VI* lid.

The *Mark I* cartridge differs from the later marks in the cordite sticks being of different lengths contained in a shalloon bag, the rear end of the cordite is not separately bundled and the igniter is of R.F.G.² new or converted powder; it has a *Mark III* lid but no wad.

† Cartridges of early manufacture have igniters of R.F.G.² or new blank F.G.

CARTRIDGE.Q.F. 4.7 INCH, MARKS I TO IV* GUNS, FILLED.
. 5 LB 7 OZ, CORDITE, SIZE 20, M^K VI.

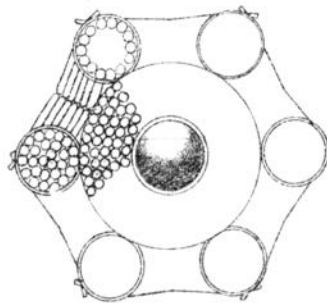
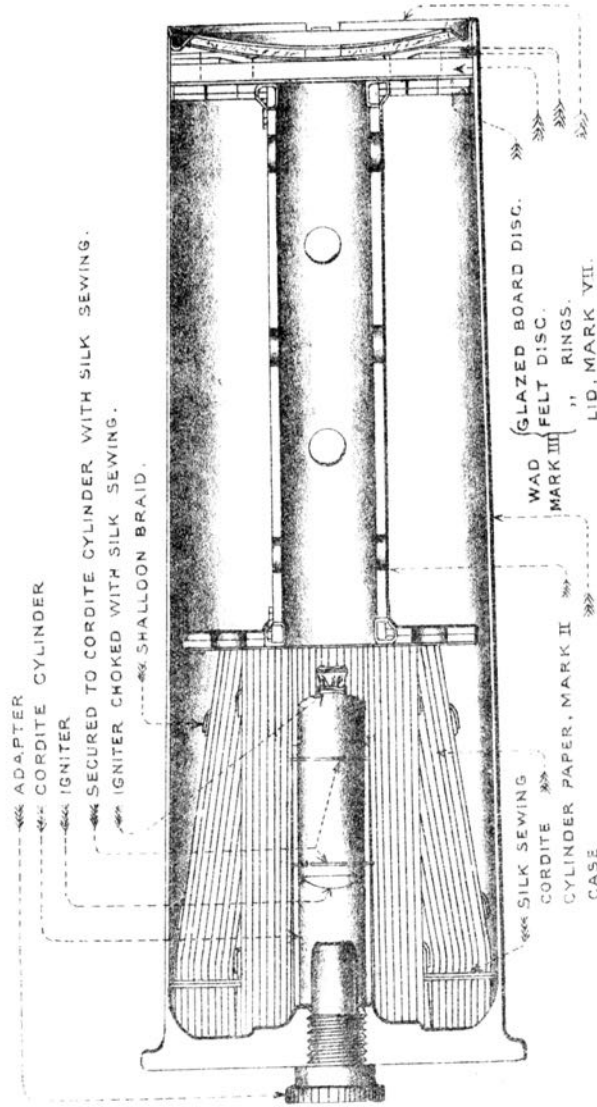
SCALE = $\frac{1}{3}$.



— BASE OF CHARGE —

CARTRIDGE, Q.F. 4.7 INCH, MARKS I TO IV* GUNS, FILLED, 2 LB. 5 $\frac{3}{4}$ OZ. CORDITE. SIZE 7 $\frac{1}{2}$, M^K III.

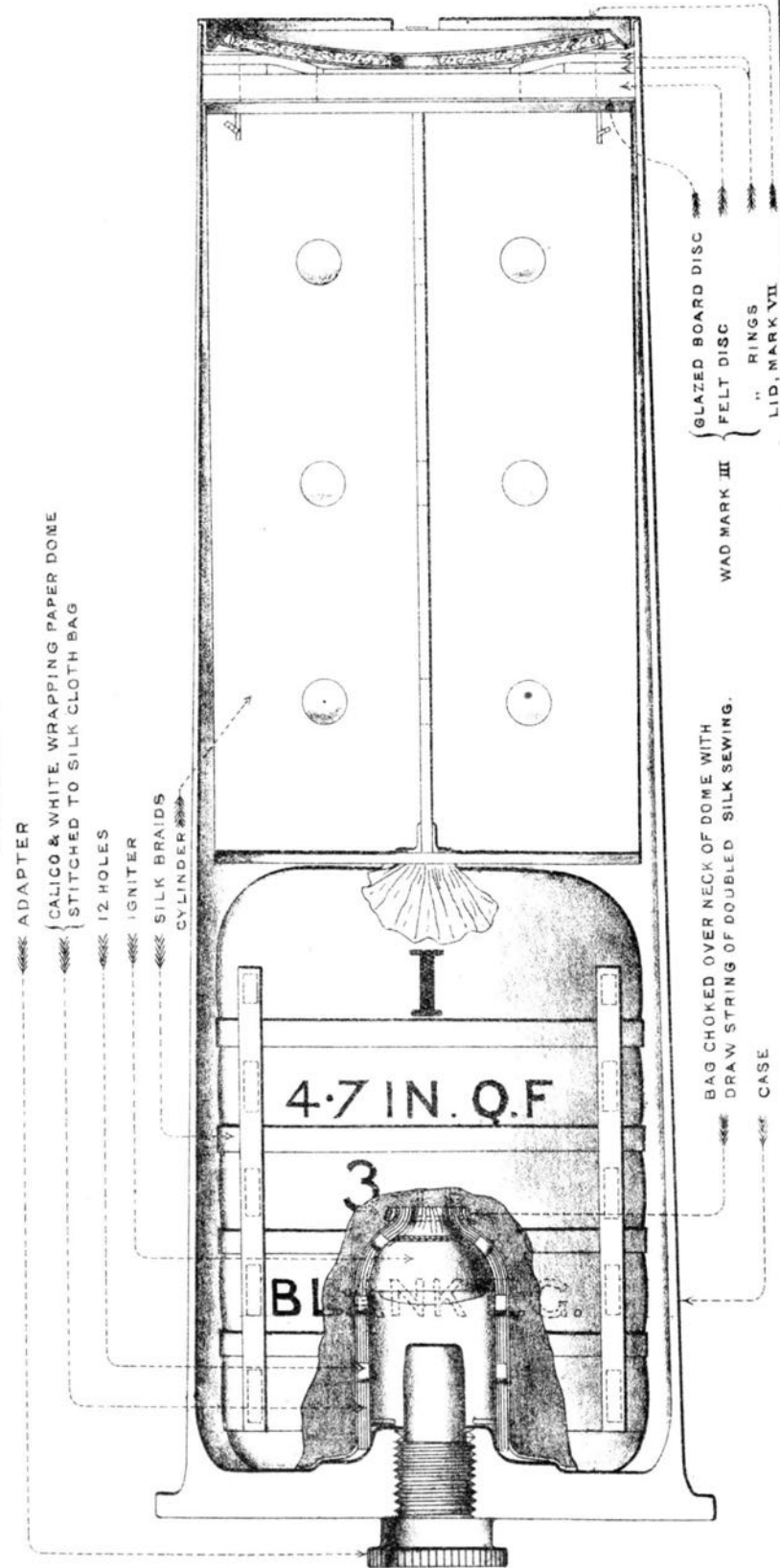
— SCALE = $\frac{1}{3}$ —



BASE OF CHARGE

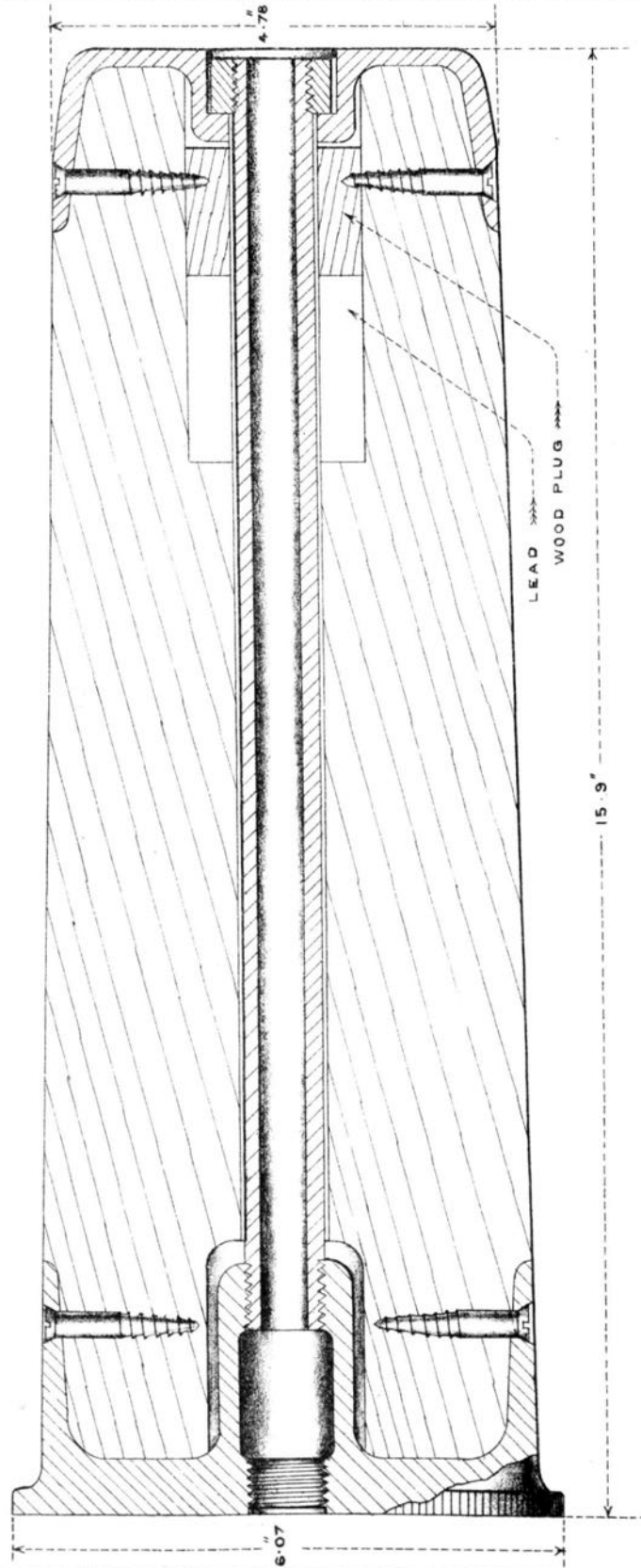
CARTRIDGE, Q.F. BLANK, 4.7 INCH, MARKS I TO IV* GUNS, FILLED, MARK V.

SCALE = 1/2.



CARTRIDGE, DRILL, Q.F. 4.7 INCH, MARKS I TO IV* GUNS, MARK VI.

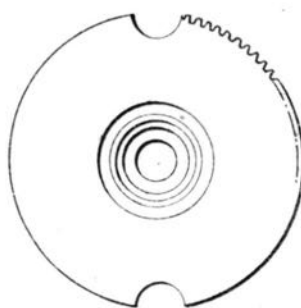
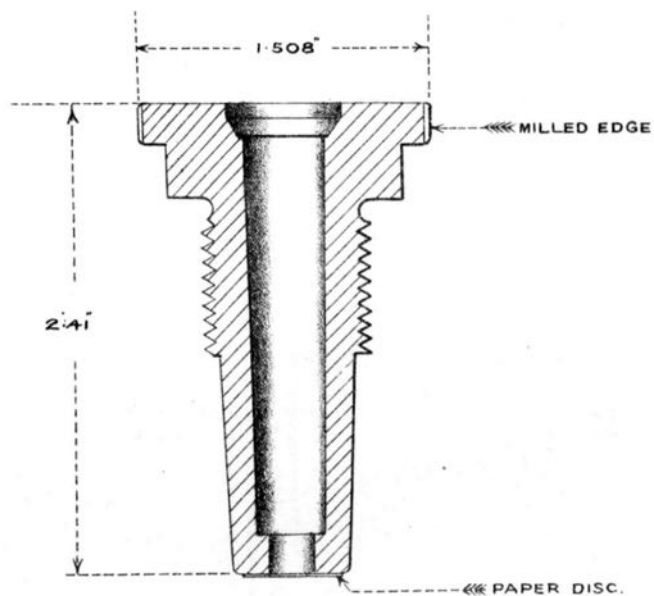
SCALE = $\frac{1}{2}$.



CARTRIDGE, Q. F. ADAPTER.

MARK IV.

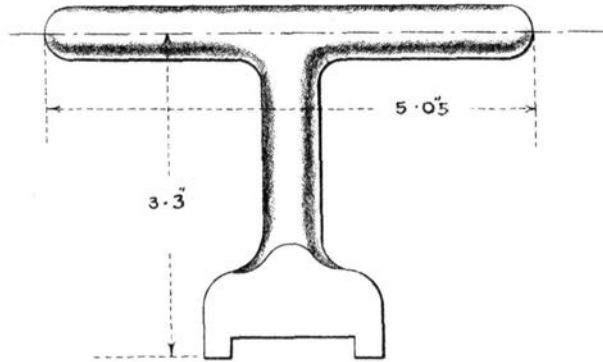
— SCALE = $\frac{1}{1}$ —



IMPLEMENTS, FUZE SHELL AND CARTRIDGE.
KEY, INSERTING ADAPTER OR ELECTRIC PRIMER.

MARK I

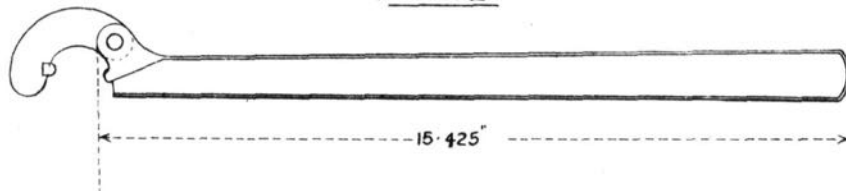
SCALE = $\frac{1}{2}$



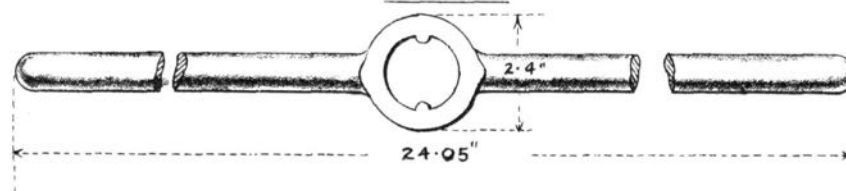
KEYS, REMOVING, ADAPTER OR ELECTRIC PRIMER.

SCALE = $\frac{1}{4}$

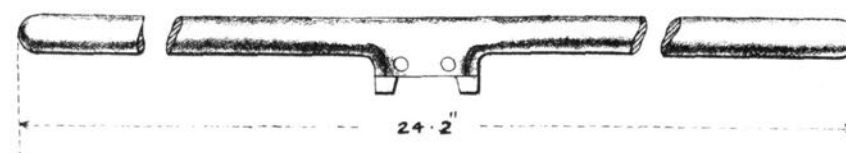
MARK IV



MARK III.



MARK II



*Note: Mark I. differs from Mark II. only
in the shape of the studs.*

CARTRIDGE Q.F. BLANK, 4.7-INCH.

(Plate XIV.)

The *Mark V* cartridge consists of the service case with adapter, charge, igniter, paper cylinder, wad, and lid.

The powder charge, consisting of 3 lb. blank L.G., is contained in a bag of No. 2 Class silk cloth, which is choked with silk and hooped with four shalloon braids passing under loops formed by three longitudinal strips of 0.35-inch braid stitched to the bag; the bag has a pocket in the bottom to take an igniter of $8\frac{1}{2}$ drams of R.F.G.² or new blank F.G. powder contained in a shalloon bag secured in a calico and paper dome, and is stitched to the silk cloth bag. The charge is held in position in the case with the *Mark II* asbestos cylinder, *Mark III* wad and *Mark VII* lid.

The *Mark IV* cartridge differs from the *Mark V* in having a longer asbestos cylinder (*Mark I*), no wad, and *Mark V*^o or *VI* lid.

The *Mark III* differs from the later marks in having a paper cylinder and *Mark III* lid.

Marks I and II cartridges were for Navy only.

DRILL CARTRIDGE.

(Plate XV.)

The *Mark VI* cartridge is made of teak, with gunmetal ends, which are secured to the teak with brass screws; a central tube runs through the cartridge from the base.

The cartridge is brought up to weight by a lead cylinder under the metal top. The base is prepared for the adapter in the usual way, and the flange is milled to facilitate handling the cartridge.

The *Mark V* cartridge differs from the *Mark VI* in the central tube, nut and screws being weaker. Cartridges altered to *Mark VI* pattern have a star (^o) added to the numeral.

ADAPTERS.

(Plate XVI.)

Mark I is made of hardened steel, with the interior shaped to take the ordinary V.S. tubes, and has a fire hole in the bottom.

The *Mark II* is shorter than the *Mark I* and is screwed at the point; it will be used with any of the cartridges for which *Mark I* igniter is used until the stock is exhausted.

Mark IV is generally similar to the *Mark I* adapter, but differs in being made of aluminium or manganese bronze, slightly more tapered, and in having the small end closed by a paper disc which is shellaced on and painted over with "Pettman" cement, to prevent the ingress of damp into the cartridge.

IMPLEMENTS, FUZE, SHELL AND CARTRIDGE.

KEYS { Inserting Adapter or Primer, electric, Q.F. or Q.F.C. large.
 { Removing Adapter or Electric Primer, Q.F. or Q.F.C.

(Plate XVII.)

These are made of mild steel to the form and dimensions shown in the plate. They are used for inserting and removing adapters in the cartridges. The latest pattern (*Mark IV*) of the "Key

removing adapter or primer" is self adjusting and suitable for removing all adapters either before or after firing.

EXTRACTOR, CARTRIDGE, HAND, Q.F. SMALL, LAND, MARK I.

This is made of steel, having a claw at one end to engage under the head of the primer or adapter when extracting the cartridge. The opposite end is fitted with a wooden handle, and has a loop of white cord for securing it to the wrist.

Total length, 10½ inches.

CARTRIDGE BOX.

The Mark I box is made of deal with ends and cleats of elm, and rope handles. The interior is fitted with six conical zinc cases each taking one cartridge, and being closed hermetically by a zinc lid with indiarubber washer which is compressed when the lid is screwed down. The sides, top, and bottom are strengthened by cleats placed obliquely, so that they fit along the cleats of the next box, and allow closer stowage. The box is painted externally.

Mark II box differs from Mark I in being of teak or mahogany; the lid is secured by four metal brackets, with wing nuts and studs let into the top of the box. It has twelve lifting bands and seven packing pieces which are each fitted with a metal spring.

A number of boxes (introduced for cartridges for the Mark V gun) have been converted to suit cartridges for Mark I to IV^o guns for land service.

Such boxes will be known as "Boxes, cartridge, Q.F. 4.7 inch Marks I-IV^o guns, land service, converted."

Dimensions &c.

			Mark I. inches.	Mark II. inches.	Converted. inches.
Length	...	...	25.25	18.9	18.9
Depth	...	...	20.25	19.1	19.375
Width	...	...	17.75	14.25	14.5

CARTRIDGE, AIMING RIFLE, 1 INCH PERCUSSION, MARK I.

The case is of solid drawn brass, having the cap chamber and anvil formed in the base; the cap is double, the outer of brass, the inner of copper. Three fire holes in the cap chamber enable the flash to pass from the cap to the charge. The charge consists of 400 grains R.F.G.² on top of which are placed wads and the bullet. The bullet is of lead, pointed, and has three cannelures which are filled with beeswax; it is secured in the case by coning the latter.

These cartridges are packed 96 in a "Box ammunition, S.A., G.S." in bundles of 12.

Weight of box, filled, about 98½ lbs.

PROJECTILES, ETC.

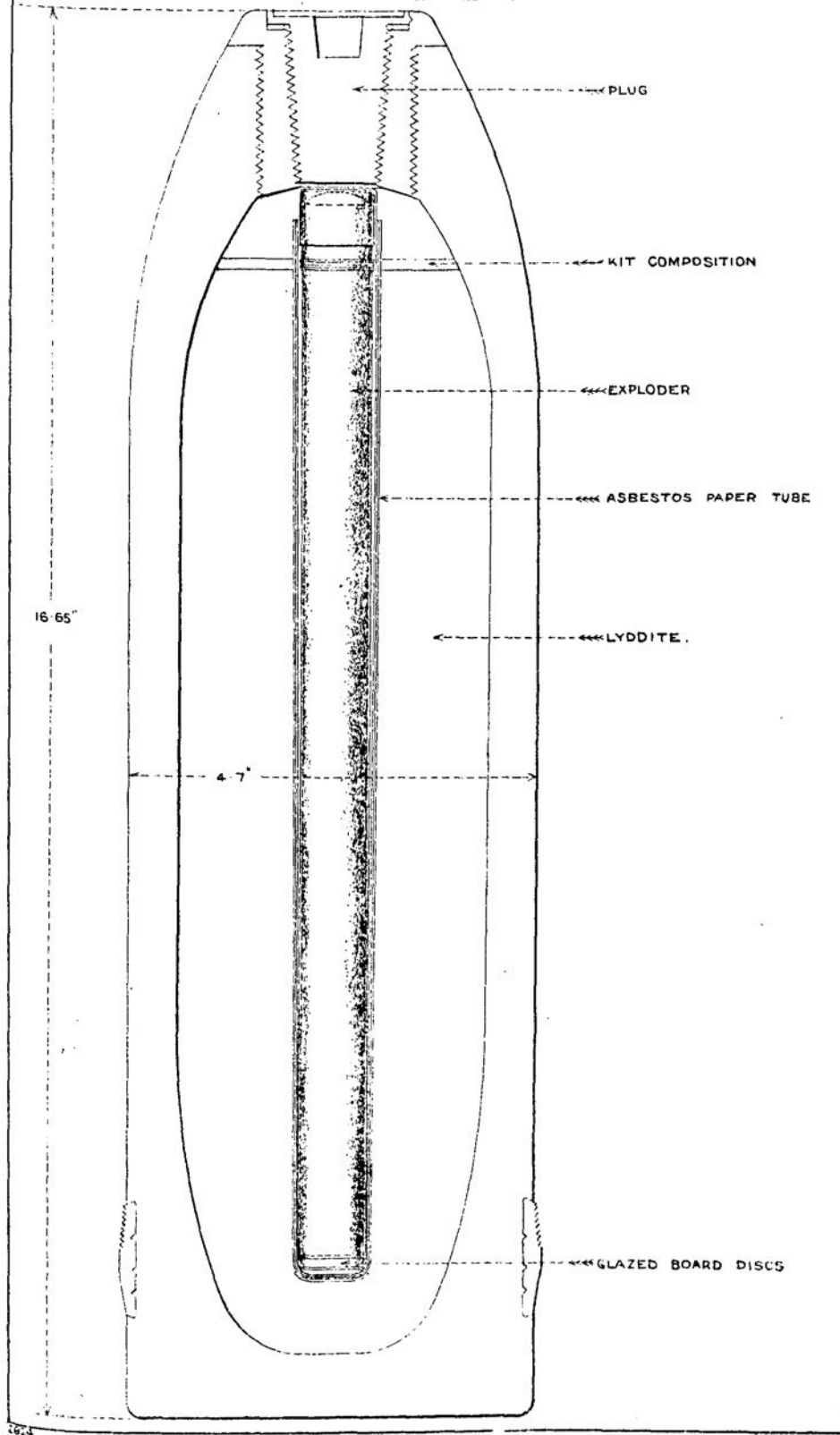
LYDDITE COMMON SHELL.

(Plate XVIII.)

The *Mark IV* shell is made of forged steel with walls 0.585 inch thick. The base is solid and the head is struck with a radius of

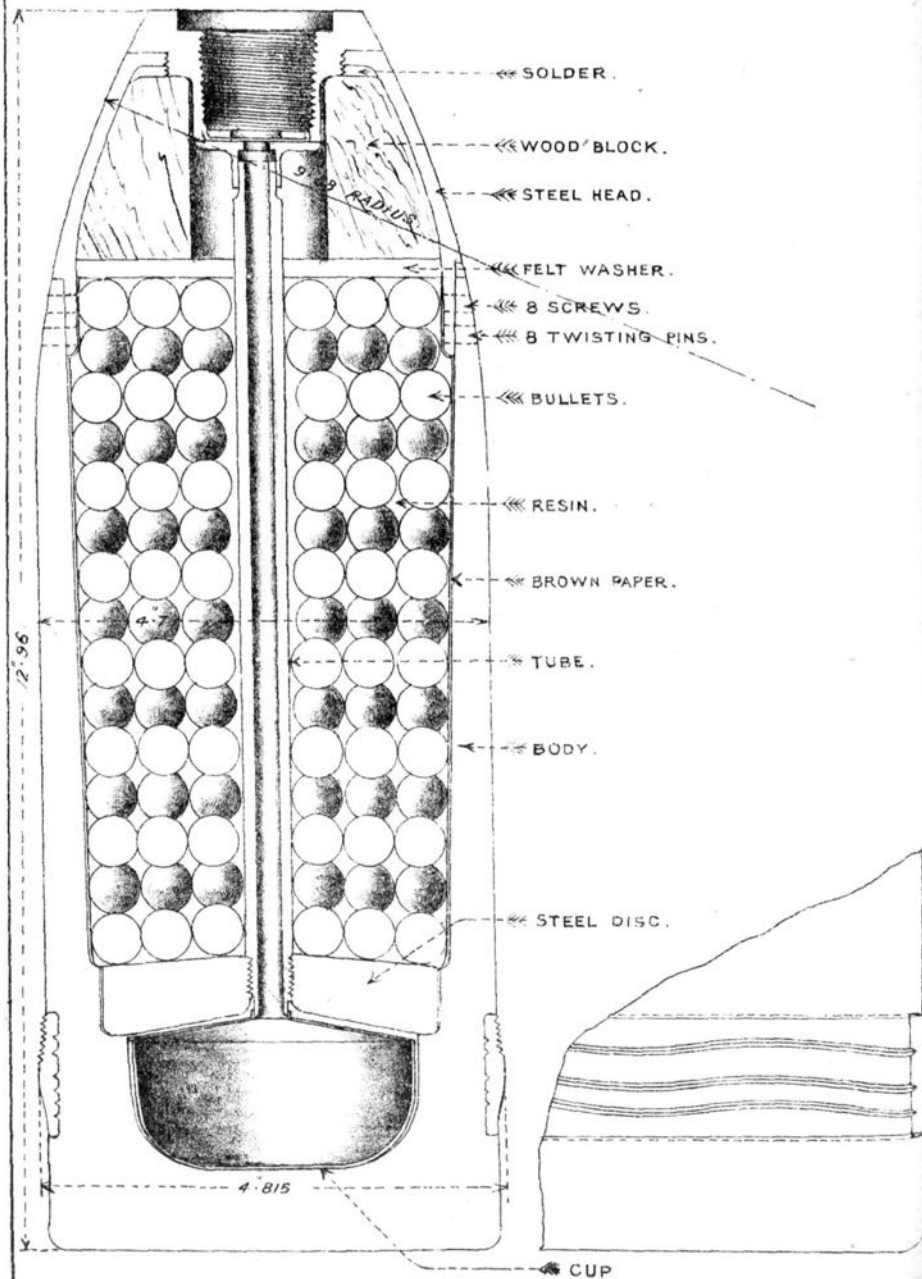
SHELL, Q.F. COMMON LYDDITE, 4.7 INCH, MARK IV.

SCALE = 1/2



SHELL, Q.F. SHRAPNEL, 4.7 INCH, MARK IV.

— SCALE = 1/2 —



two diameters, the point being truncated and fitted with a gun-metal bush screwed to the G.S. fuze hole gauge.

A plain copper driving band with front slope serrated is pressed into a groove 1.2 inches from the base; the groove has three waved ribs turned in it to prevent the band turning on the shell, and three chisel cuts across the ribs to facilitate the pressing on of the band.

The interior of the shell is varnished and filled with lyddite, a cavity being left down the centre for the exploder and fitted with an asbestos paper tube. A layer of kit composition is placed on top of the lyddite.

A $3\frac{3}{4}$ oz. picric powder exploder in a batiste (shalloon in earlier marks) bag, enclosed in a waterproofed paper cylinder 12.5 inches long and closed with an aluminium cap, is used with this shell, one or more glazed board discs being placed at the bottom of the cavity to bring the aluminium cap flush with the bottom of the fuze hole.

The *Mark III* and *III^a* shells differ principally from the *Mark IV* in having slightly thicker walls (0.61 inch), and in the method of filling. The *Mark III^a* has a plain driving band of the same pattern as the *Mark IV*, but the *Mark III* has a band with two cannelures and the front slope serrated.

The shells are filled to the bottom of the fuze hole and there is no asbestos paper lining to the cavity for the exploder.

The *Mark II* shell is thinner in the walls (0.525 inch) and slightly longer. It has a driving band of the same pattern as the *Mark III*.

Mark I shell differs only from the *Mark II* in the groove for driving band not being undercut and in the front slope of the band not being serrated.

The shells are closed with a "plug, fuzehole, special," having a leather washer under the shoulder; three punch stabs are made in the head of the plug and bush, thus further securing the plug.

Lyddite shells are issued filled; no preparation is required before loading them in the gun other than removing the plug and fuzeing them.

SHRAPNEL SHELL.

(Plate XIX.)

The *Mark IV* shell is made of forged steel, with a steel head struck with a radius of two diameters. The point is truncated and fitted with a gunmetal bush screwed to the G.S. fuze hole gauge.

The driving band and groove are similar to those described for the *Mark IV* lyddite shell.

A cup containing a bursting charge consisting of $4\frac{1}{2}$ oz. R.F.G.² powder is fitted in a recess in the base, and a central gunmetal tube connecting the bursting charge and the fuze is also fitted, the upper end into the fuze hole bush, the lower into a steel disc placed over the cup containing the bursting charge.

The shell is lined with brown paper and contains about 580 bullets (35 per lb.) with a few buck shot to regulate the weight, the interstices being filled with resin.

On the top of the body is a felt washer and a wood block, the head being attached to the body with screws and twisting pins.

The *Mark III* shell differs from the later mark in the shape of the head and G.S. fuze hole socket. It is longer and has parallel walls instead of tapered, and contains 206 mixed metal bullets (14 per lb.).

The upper part of the central tube is fitted with a metal primer.

A driving band with two caunelures and front slope serrated is fitted to this shell.

Mark I and *II* shells differ from *Mark III* in having thinner walls and head, and in having a 5-oz. bursting charge. The fuze hole socket is longer internally and is screwed at the lower end to take the metal primer. The same driving band is used as in the *Mark III*, but in the case of *Mark I* shell the groove is not undercut.

COMMON IRON SHELL, MARK I.

(Plate XX.)

This shell is made of iron and is fitted with a gunmetal bush which is screwed internally to the G.S. fuzehole gauge.

The driving band and groove are the same as those described for the *Mark IV* lyddite shell.

The bursting charge of 1 lb. 8 oz. L.G. powder is contained in a dowlas bag having a shalloon neck, choked with string.

DRILL SHELL.

(Plate XXI.)

The *Mark III* shell is made of wood, brought up to the weight of the service projectile by a lead core. It is fitted with a bolt which passes through the centre of the shell and is screwed into a gunmetal nut, which forms the point of the shell. The base is of gunmetal, having a bayonet joint recess to receive the T-shaped projection of the extractor. Two copper bands are fitted in grooves, one near the shoulder and one near the base of the shell to prevent injury to the rifling of the gun.

The *Mark^o II* shell is similar to the *Mark III* except that it has one copper and one gunmetal band instead of two copper ones.

EXTRACTOR DRILL SHELL No. 4.

The *Mark II* extractor is a steel bar, 0.625 inch diameter, 47.6 inches long, having at one end a T-shaped handle 5.5 inches long and at the other a T-shaped projection to fit the slot in the recess of base of the drill shell.

FUZES.

(Plates XXII to XXV.)

FUZE, PERCUSSION, DIRECT ACTION WITH CAP, No. 1, MARKS I*, I**, II AND III.

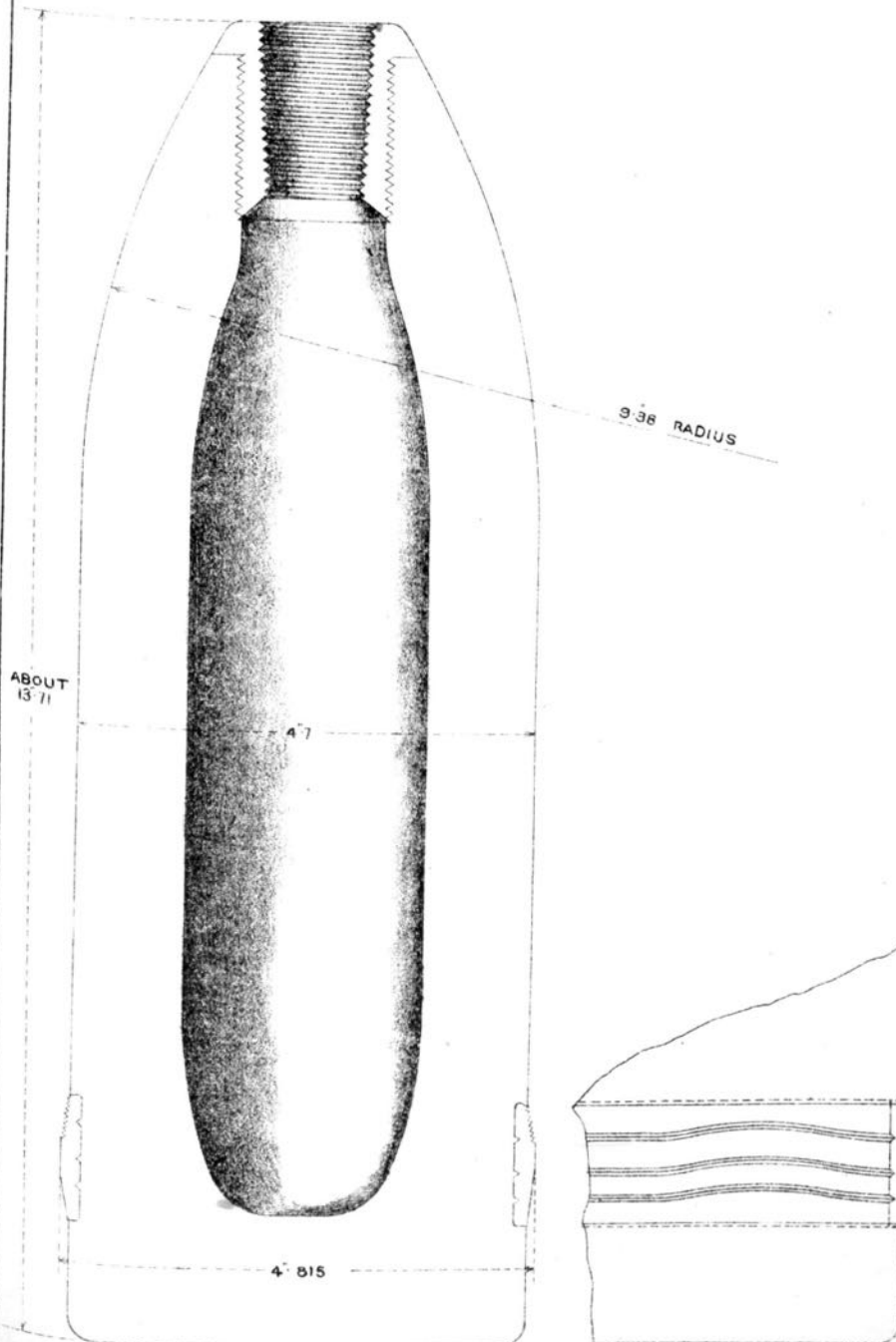
(Plate XXII.)

For use at practice with common iron shell and on service with lyddite shell.

Mark II.—This fuze is intended to act on direct impact; it cannot be depended on to act on graze unless fired at angles of elevation of 10° and upwards.

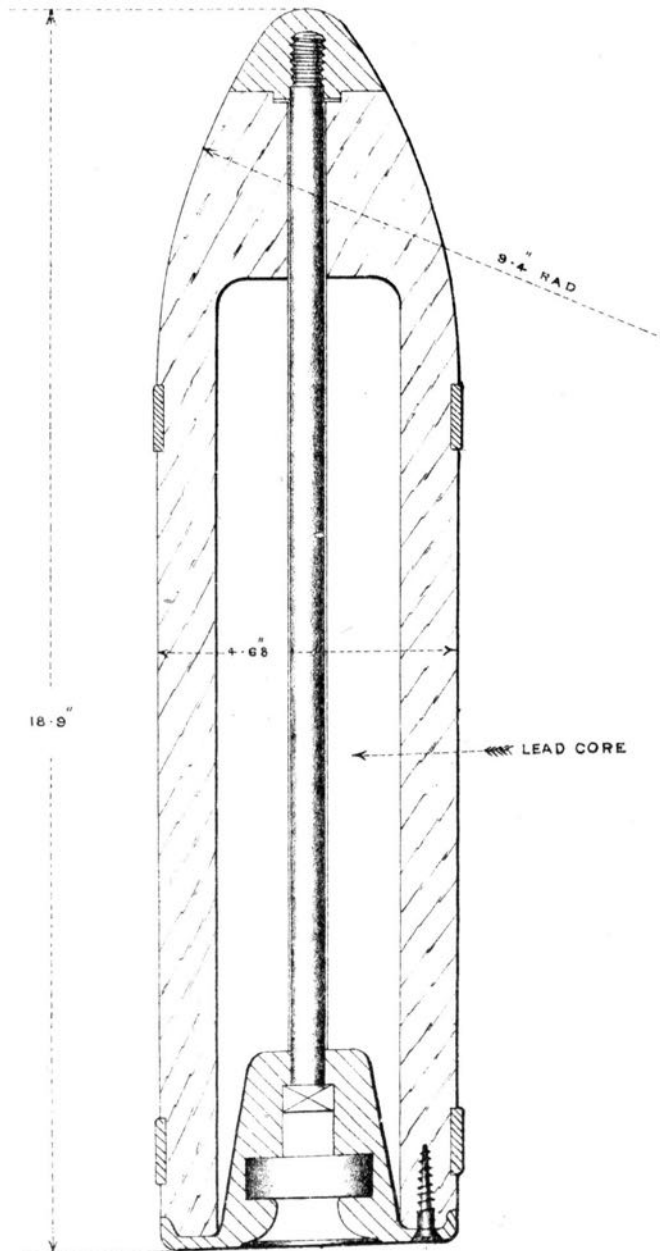
SHELL Q.F., COMMON, 4.7. INCH, IRON, MARK I

Scale = $\frac{1}{2}$ "



SHELL, Q.F. DRILL, 4.7 INCH, MARK III.

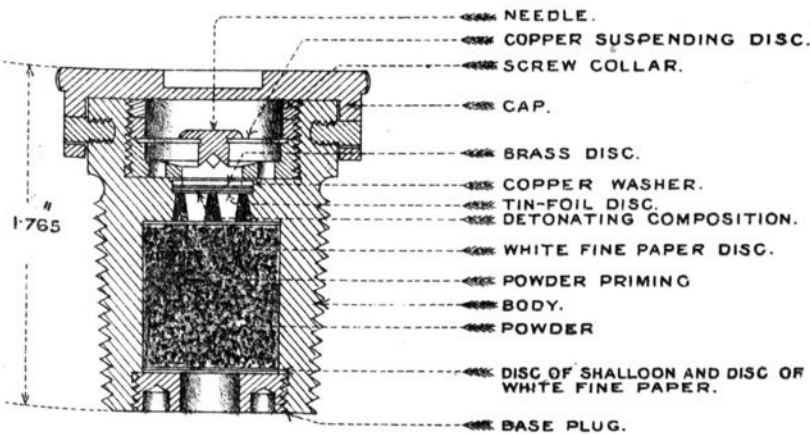
SCALE = 1/3.



FUZE, PERCUSSION, DIRECT ACTION, WITH, CAP, N° 1.

MARK II.

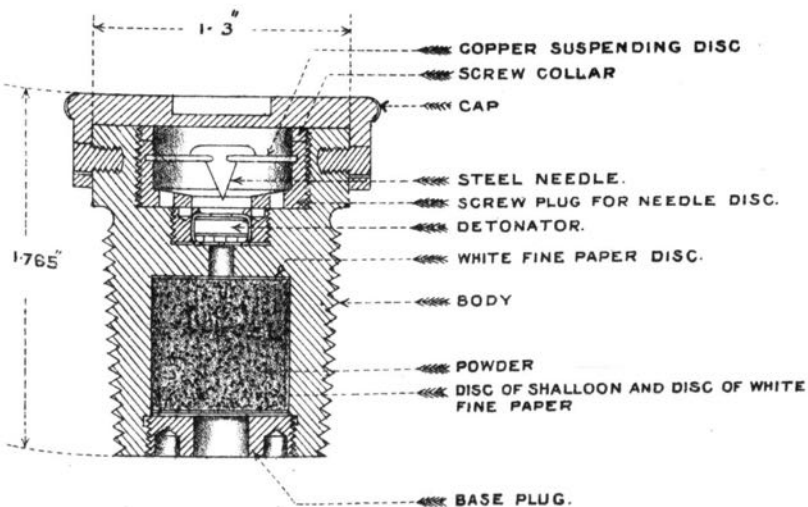
SCALE = $\frac{1}{1}$



FUZE, PERCUSSION, DIRECT ACTION, WITH CAP N° 1.

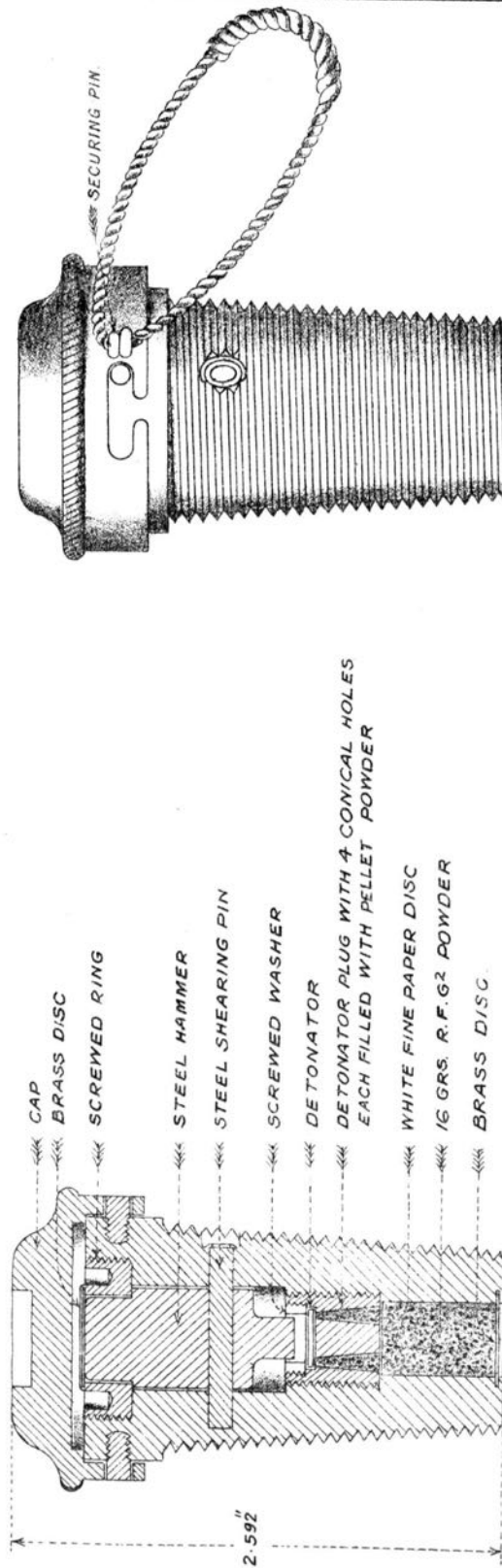
MARK III

SCALE = $\frac{1}{1}$



FUZE, PERCUSSION, DIRECT ACTION, IMPACT, No 13, MARK IV.

SCALE $\frac{1}{1}$.



It is made of gunmetal, screwed below the head to fit G.S. fuze hole. The interior is bored out at the lower end for the powder charge and closed with a screw base plug. A recess in the upper part of the fuze is charged with detonating composition, and the holes communicating with the magazine are filled with powder priming. The fuze is fitted with a steel needle, passing through and secured in a copper suspending disc, .032 inch thick. The lower part of the fuze is filled with 75 grains of pistol or R.F.G.² powder. A gunmetal cap, having a T-shaped slot cut out in each side to fit over the projecting pins in the head of the fuze, is secured over the top.

On striking any object the suspending disc is driven in and the needle is forced against the detonating composition, thereby exploding the fuze.

Mark III differs from Mark II in having a removable detonator, a single-pointed needle, and a slightly smaller magazine, containing 65 grains of powder.

Marks I* and I** fuzes may also be used.

Weight 7½ oz.

These fuzes are issued 5 in a tin cylinder, for this equipment.

FUZE, PERCUSSION, DIRECT ACTION, IMPACT, No. 13, MARK IV.

(Plate XXIII.)

For use at practice with lyddite shell.

This fuze, which is of gunmetal, is screwed externally below the head to the G.S. gauge.

The head is turned and has a projection on each side to engage the cap with which the fuze is furnished.

The body is bored throughout its length and contains a steel hammer, detonator plug containing detonator, and 16 grains of R.F.G.² powder.

The hammer is held in suspension over the detonator by a steel shearing pin which passes through the side of the fuze and is spun in.

The detonator plug has a recess in the top to take the detonator and has also four conical holes filled with pellet powder.

The detonator, consisting of 1 grain of R.F.G.² mealed powder is secured in the plug by a brass screwed washer.

The fuze is closed at the head by a screwed ring with a brass disc spun in, and at the base with a brass washer spun in.

The cap has a T-shaped cut in each side of its rim to lock on the projections on the body where it is further secured by a securing pin. The cap has also a square keyhole in the top to take the fuze key for screwing the fuze into the shell.

The fuze requires no preparation beyond removing the securing pin and cap at the moment of loading.

On impact the hammer is driven in shearing the steel pin and igniting the detonator, the flash passing through the detonator plug into the magazine.

Mark IV is the latest Mark of this fuze; the earlier Marks, I^{oo} II^o and III^o have been altered to conform with Mark IV.

Weight { of fuze, 10-oz.
... .. { of cap, 3-oz.

These fuzes are issued 1 in a tin cylinder, for this equipment.

FUZE, TIME AND PERCUSSION, MIDDLE, No. 54, MARK III.

(Plate XXIV.)

For practice up to 75% for guns in movable armament of stations abroad and for the defence of land fronts at home; also for equipment and practice of guns with Territorial Force.

Mark III.—The body is hollow, and has a stem on its upper side. Round the base of the stem an annular groove is cut, from which a hole is bored to the side of the body for the gas to escape through. The sides of the body are pierced with three fire holes; the top of the body is screwed to receive a hexagonal cap. Between the cap and the dome fits a brass washer with feathers fitting into slots on the stem of the body; it is to prevent the dome from turning with the nut and altering the setting of the fuze when the cap is screwed tight.

The percussion pellet has a slot in the side for the safety pellet and brass ball to fall into, when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a charge of F.G. powder, and then the needle plug which is screwed in; the latter is perforated with six fire holes and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet to prevent the latter turning in flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet, and the opposite end in a corresponding recess in the fuze body.

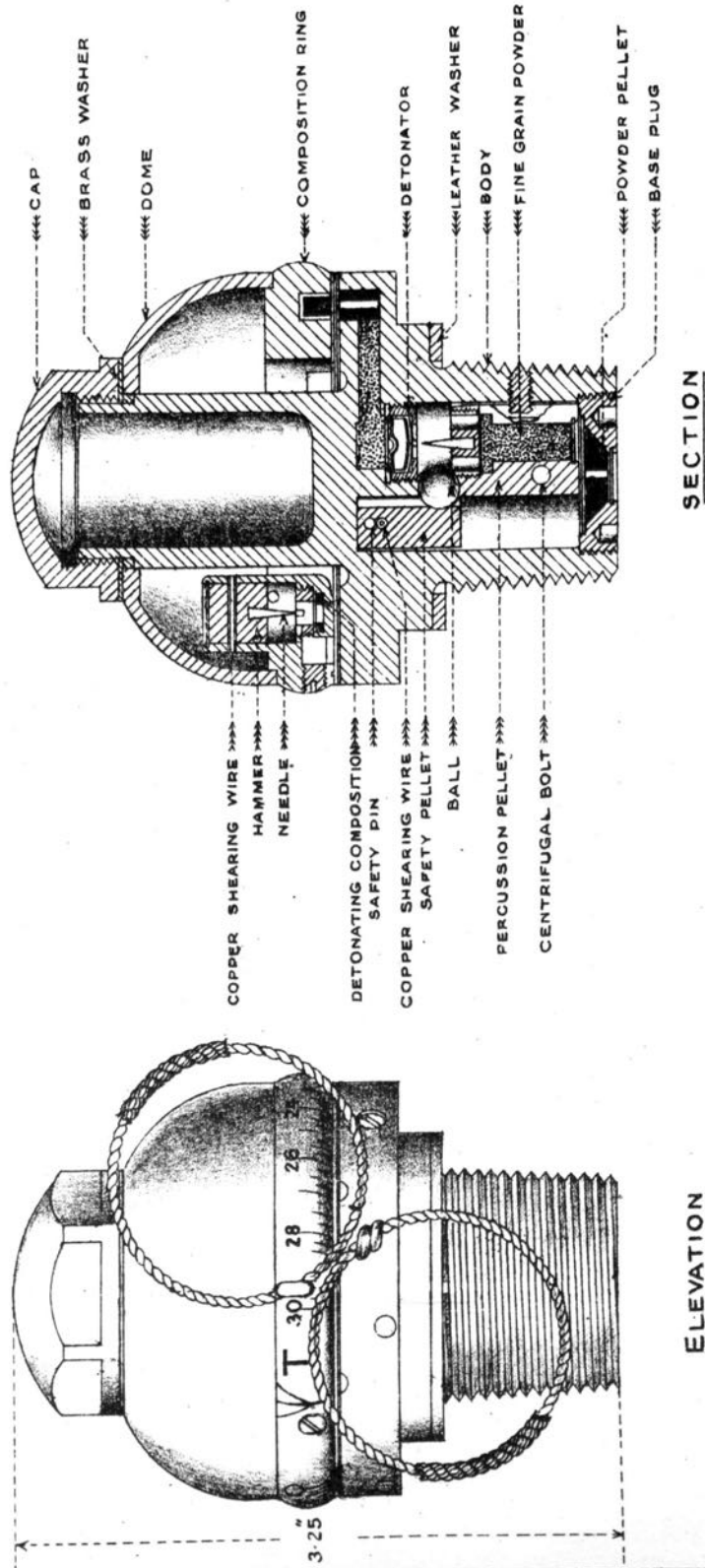
The *safety pellet* has a slot cut in the side to clear the brass ball and is suspended in the body by a thin copper wire passing through it. A hole is also bored in the upper part of the pellet and body of fuze for the safety pin to pass through.

The *base plug* has a conical hole bored in it, and is closed at the bottom by a shallow disc and brass washer spun in; it contains a perforated pellet of pressed powder, secured by a brass washer spun over on top. The plug is fixed by stabbing in three places.

The *composition ring* has an annular groove round it for the composition; a projection on the upper side contains the hammer with steel needle, suspended by a 0.022-inch wire, and a detonator under it for lighting the composition in the ring. The hammer is also secured by a safety pin passing under it, the hole in the ring left by its withdrawal being closed by a brass pellet with a spiral spring above it. The ring is barrel shaped outside to facilitate the setting of the fuze, and is kept in position by three projections on the side, which fit closely round the stem of the body. Two holes are bored through the top of the ring at the commencement of the composition and covered with paper. The ring is graduated from 0 to 30, and reads as quarter units, and has an arrow head between the last graduation and the commencement to show the position of safety.

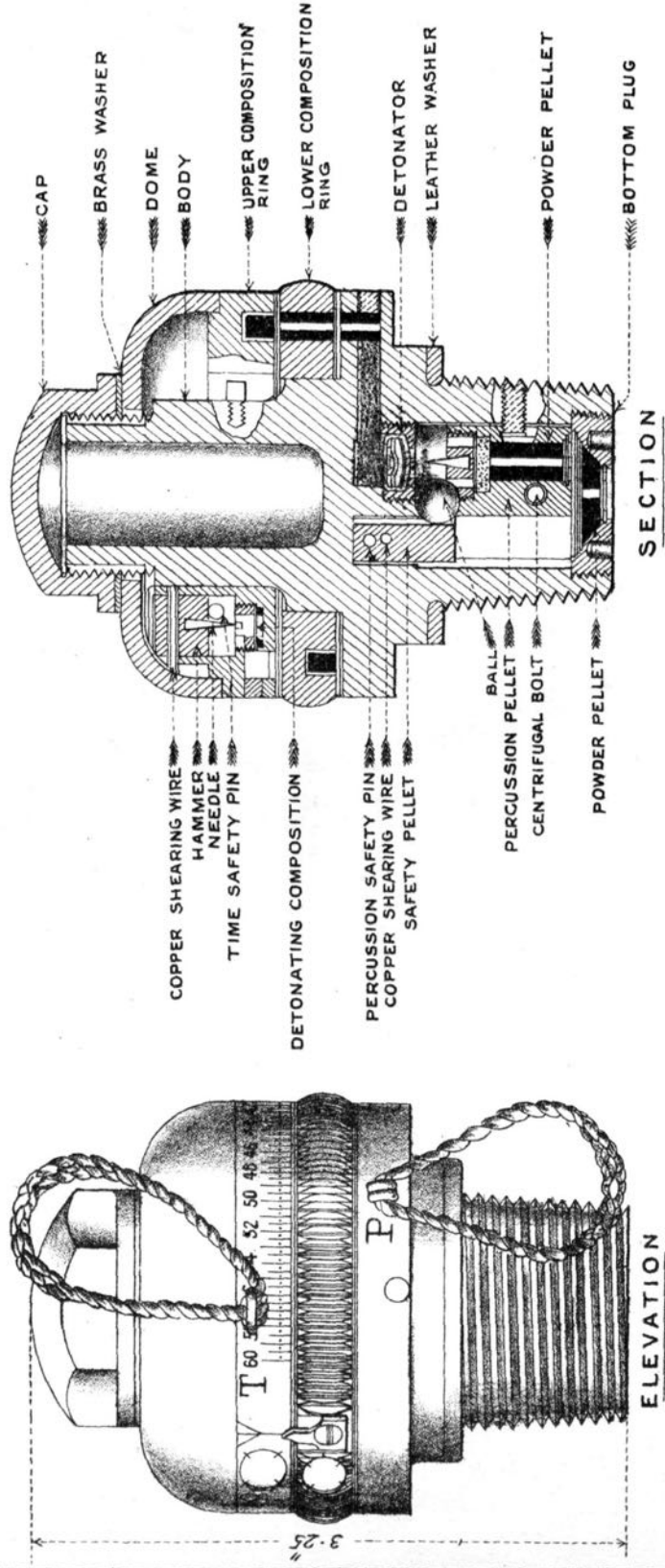
FUZE, TIME AND PERCUSSION, MIDDLE, N^o 54, MARK III

SCALE = $\frac{1}{1}$



FUZE, TIME AND PERCUSSION, N° 62, MARK II.

SCALE = $\frac{1}{16}$



The body has an arrow head or black triangular mark on it for setting the fuze, opposite which is a hole from the surface to the percussion arrangement, filled with powder, for communicating the flash when the composition has burnt to it.

A small hole is made in the side to receive the pin in the semi-circular arm of the universal fuze key when screwing the fuze into the shell.

The fuze is stamped **T** on the ring close to the "time" safety pin, and **P** on the body close to the "percussion" pin to distinguish them. The time safety pin has a scarlet loop. If the fuze is required to act as a percussion fuze only, the **P** pin should be withdrawn, if as a time fuze only, the **T** pin, and if as a time and percussion fuze, both pins.

To set the time arrangement of the fuze, the nut is loosened with the "key, fuze, universal," and the ring moved round till the required graduation is opposite the arrow or black triangular mark on the body, the nut is then tightened, great care being taken to see that it is screwed down as tightly as possible.

The time of burning of the fuze at rest, when set at 30, or full length, is 16 seconds.

Action.— On discharge, if the "time" safety pin has been withdrawn, the hammer sets back, shearing the suspending wire, and fires the detonator, which lights the end of the ring of composition; this burns until the channel communicating with the lower part of the fuze is reached, when the flash passes down it and fires the detonator and magazine in the percussion arrangement.

If the "percussion" pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug into the shell.

Weight 1-lb. 4-oz.

Fuzes which have been refitted with 0.35 grain detonators will have a star added to their numeral.

No. 54 fuze will be superseded by No. 62 when existing stock is used up.

FUZE, TIME AND PERCUSSION, No. 62 (MARKS I AND II).

(Plate XXV.)

For equipment of guns in movable armament of stations abroad and for the defence of land fronts at home; also for practice purposes up to 25% exclusive of guns with Territorial Force.

The Mark II fuze principally consists of the following parts, which are made of gunmetal, except where otherwise stated; Body, detonator plug with detonator, percussion pellet with needle plug and steel needle, brass safety pellet, brass ball, base plug, time composition rings (upper and lower), brass springs, dome, brass washer, cap, two safety pins, and leather washer.

The *body* is screwed at the lower end to G.S. fuze hole gauge, and bored from the bottom to receive the percussion pellet and base plug.

Two holes are bored beyond the recess for the percussion pellet, one for the detonator plug, the other for the safety pellet. The hole bored for the detonator plug is continued horizontally to form a small magazine, which is filled with fine grain powder, the hole then leads upwards to join the time rings, and contains a perforated powder pellet. The stem of the body is fitted with two studs to engage corresponding slots in the upper ring to prevent it revolving and is screwed to take the cap, two featherways being cut in top end of stem to receive corresponding feathers on the brass washer over dome. A small tablet of fine white paper is secured with shellac to the body of the fuze over the perforated powder pellet, and over this tablet are two washers, one of fine white paper, and the other of cloth, which are secured with shellac, a hole being cut through the washers and tablet immediately over the powder pellet; similar tablet, pellet, and washers exist on top of the lower time ring.

The *detonator plug* is screwed on the outside to fit the hole prepared for it, and contains a detonator, which consists of a copper cap with fire holes filled with $3\frac{1}{2}$ grains of detonating composition, with a 0.005-inch brass disc under the composition and a tinfoil disc over it, to prevent the composition working through the holes.

The *percussion pellet* has a slot in the side for the safety pellet, and brass ball to fall into when set in action. For additional safety a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a perforated powder pellet ($5\frac{1}{2}$ grains) having under the latter a muslin disc and brass washer, and over it one grain of fine grain powder, and then the needle plug, which is screwed in; the latter is perforated with six fire holes, and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet, to prevent the latter turning in flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball, and is suspended in the body by a thin copper wire which passes through it. A hole is also bored in the body and upper part of pellet for the percussion safety pin; the hole in the body left by the removal of the safety pin is closed by a brass pellet having above it a spiral spring in compression.

The *base plug* contains a perforated powder pellet; over the latter are two discs, one paper the other muslin, and a brass washer, and under the pellet a shalloon disc and a brass washer. The base of the fuze is closed by the plug, which is made secure by being stabbed in three places.

The *composition rings* have each a channel, which is lined with asbestos paper, for the fuze composition, and a hole is provided which allows the gas direct escape outside; this escape hole is lightly closed by means of a brass disc covered without by Pettman cement.

The upper ring has a chamber which contains a hammer with steel needle; the hammer is suspended by a 0.022-inch copper

wire, a safety pin also passes through the ring and under the hammer; the hole in the ring left by the withdrawal of the pin is closed by a pellet of brass as mentioned above for the percussion safety pin (*see* Safety Pellet). Under the needle is detonating composition and mealed powder. The composition channel on the under side and the chamber are connected by a lighting hole, the composition being roughened at the lighting point to assist ignition. The outside of the ring is graduated from 0 to 60 each division being sub-divided into halves and quarters, with an arrow point on bridge portion to mark the position of safety, *i.e.*, when the arrow and pointer are in the same vertical plane. The interior of the ring has two slots which engage studs on the stem to prevent the ring revolving.

The lower ring has a composition channel similar to the upper ring. The outside of the ring is barrel shaped and milled to facilitate setting, and fitted with a setting pointer of cupro nickel.

The dome, brass washer, and hexagonal cap are put on the fuze in the order here given.

The dome is of sheet brass, stamped into shape, and covers the time lighting arrangement.

The washer has two feathers, which engage in featherways cut in the stem of fuze; its object is to prevent the dome from turning and altering the setting of the fuze through friction when screwing down the cap.

The cap must be clamped tightly; this is most important; if not done, the composition may explode instead of burning. Care must also be taken when clamping not to alter the setting.

The fuze is stamped **T** on the upper composition ring close to the time safety pin, and **P** on the body close to the percussion safety pin. The pins are each provided with a whipcord becket or loop, the **T** one being scarlet, and that of **P** tarred.

The openings in the fuze are coated with Pettman cement to exclude damp.

A leather washer in a groove above the fuze hole thread makes a tight joint.

The fuze should be set *before* the safety pins are withdrawn.

To set the time arrangement, the cap is loosened with the "Key, fuze universal" and the ring moved round until the graduation ordered and the pointer coincide; the fuze is then clamped by screwing down the cap as tightly as possible, care being taken that the ring and dome have even bearings, and the setting has not shifted.

If the fuze is required to act as a percussion fuse only, the **P** pin should be withdrawn and the **T** pin left in position; otherwise both pins should be withdrawn, but this should not be done till the moment of loading.

Action.—On discharge, if the "TIME" safety pin has been withdrawn, the hammer sets back shearing the suspending wire, and igniting the detonator and the composition in the upper time ring, which burns until it reaches the position indicated by the setting pointer, the flash then passes through a hole in the lower ring to the composition in its under surface and burns back in the opposite direction until it reaches a hole in the body (which is directly under the zero point of the upper ring) where it flashes

down through the radial magazine, percussion detonator and pellet, and base plug, into the shell.

If the percussion pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug into the shell.

The time of burning at rest is about 35 seconds.

Weight of Mark II fuze (about) 1 lb. 9½ oz.

Mark I fuze differs from the Mark II principally in the following particulars :—

1. The dome is thinner.
2. The stem of the body is thinner and slightly shorter.
3. It has two setting pointers, one of which is fixed to the lower time ring, and the other to the body under the rings.
4. The upper time ring is barrel shaped on the outside to facilitate setting, and is graduated from 0 to 30.
5. The lower time ring is flat on the outside and graduated from 30 to 60.
6. The fuze is slightly lighter, the average weight being 1 lb. 7 oz.

FUZES, DRILL.	{	Percussion D.A., with cap, No. 1.
		Time and Percussion, Middle No. 54.
		Time and Percussion, No. 62.

The drill fuzes resemble, generally, the service fuzes which they represent, and in some cases burnt-out service time and percussion fuzes are used for this purpose.

To facilitate identification, the drill fuzes are stamped "*Drill*," and bronzed.

TUBES.

TUBES, VENT-SEALING, PERCUSSION.

(Plates XXVI and XXVII.)

Mark VII is the latest mark of this nature of tube, which consists of a body, cap, cap-holder, striker, brass washer, copper shearing wire, striker-holder, two paper discs and a cork plug.

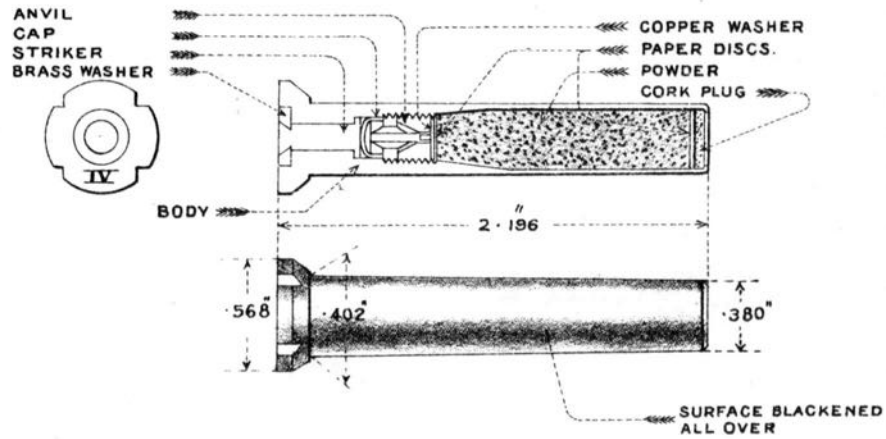
The body is of brass; the head is bored centrally to receive the cap and striker, the front end of this recess is formed into a raised anvil through which two fire channels are bored. The cap is held in position on the anvil by the cap-holder, and above the latter is screwed the striker-holder in which is secured the striker by a copper shearing wire, and by being riveted at its outer end to a brass washer.

The lower part of the tube is filled with pellet powder. The tube is closed with a paper disc and cork plug which is coated with varnish, and further secured by the end of the tube being burred over.

Percussion V.S. tubes of present manufacture are blackened all over, and have four notches cut in the rim of the head to distinguish them from wireless electric tubes by sight or touch.

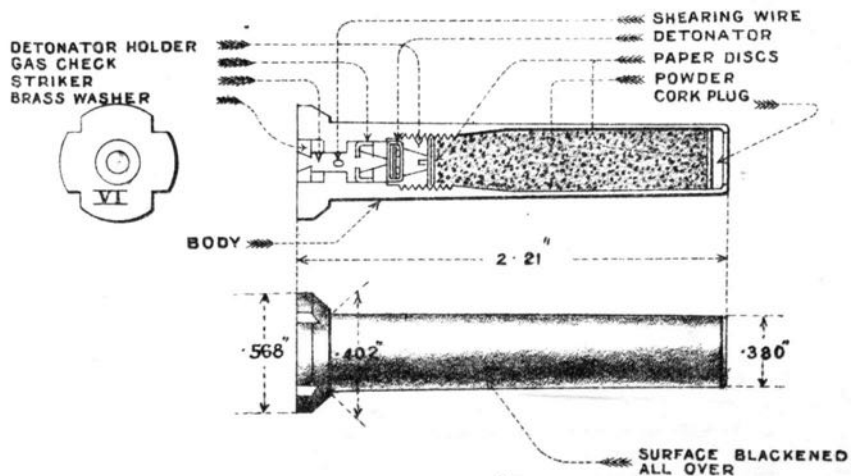
TUBE, VENT SEALING, PERCUSSION, MARK IV

SCALE - $\frac{1}{1}$



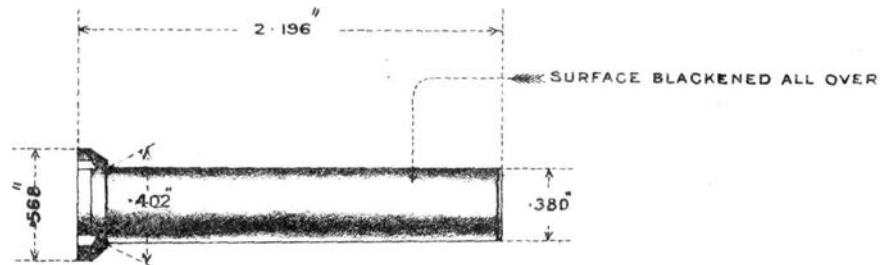
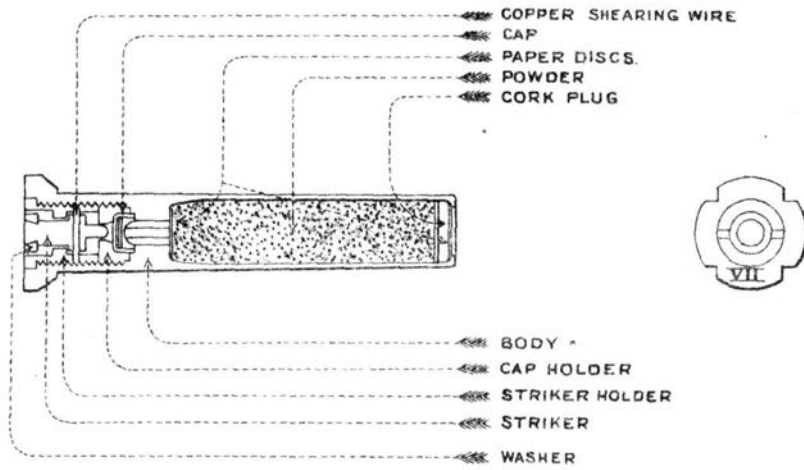
TUBE, VENT SEALING, PERCUSSION, MARK VI.

SCALE = $\frac{1}{1}$



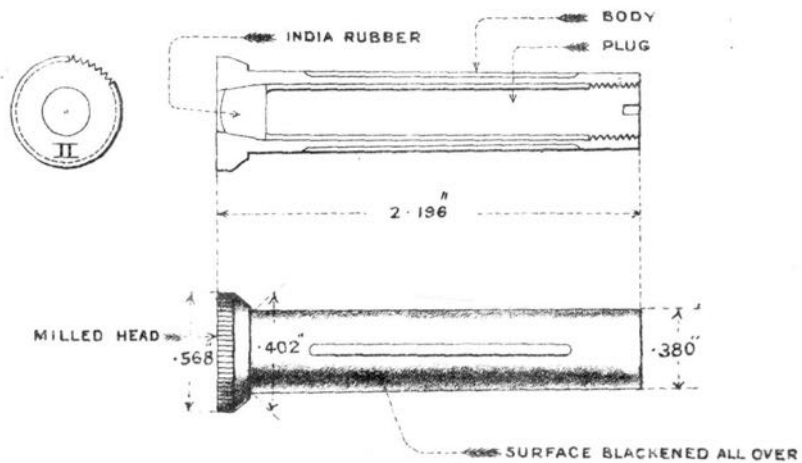
TUBE, VENT SEALING, PERCUSSION, MARK VII

SCALE = $\frac{1}{1}$



TUBE, VENT SEALING, PERCUSSION, DRILL, MARK II.

SCALE = $\frac{1}{1}$



Action.—On firing the gun the point of the striker of the percussion lock drives the striker of the tube together with the cap on to the anvil, thus firing the tube.

Mark VI consists of a body, striker, detonator, detonator holder, two washers, shearing wire, two paper discs, and cork plug.

The body is of solid drawn brass; the head is bored centrally for the striker, detonator, and fire channel. The striker is of brass with a needle point, and a plain flange at its base, under which is fitted a copper cup-shaped gas check; and it is held in position by a copper shearing wire passed through the tube, and a brass washer in the recessed head of the tube. The detonator is fitted into the holder, and the latter is screwed into the body of the tube. Under the detonator holder is a copper washer, and a disc of fine white paper. The lower part of the tube is filled with pellet powder. The tube is closed with a paper disc, and cork plug which is coated with varnish, and further secured by the end of the tube being burred over.

Action.—On firing the gun the point of the striker of the percussion lock drives the striker of the tube on to the detonator, thus firing the tube, the flash passing on to the charge.

Mark V tube differs from Mark VI in the form of the striker, which is without the cup-shaped gas-check, and the detonator which is held in position by a brass-screwed collar. *This Mark will be used up for drill and instructional purposes only.*

Mark IV.—This consists of a body, anvil, striker, brass washer, percussion cap, copper washer, two paper discs, and a cork plug. The body is made of brass, solid drawn; a hole is drilled through the head to receive the striker, which is secured in position by being riveted into the countersunk washer. The upper part of the chamber is screwed and fitted with an anvil, on which is placed the percussion cap, the upper surface of which is in contact with the striker; a small central and two diagonal fire-holes are drilled through the anvil. The remainder of the space in the tube is filled with loose pellet powder, and the bottom is closed with a paper disc, and cork plug coated with varnish.

Action.—This is the same as Mark VI tube, excepting that the striker of the tube, together with the percussion cap, is driven on to the anvil thus firing the tube.

Mark III is the same as Mark IV, except that the bottom of the tube is closed with a paper disc and perforated brass ball, embedded in sulphur and secured with shellac. Care must be taken to see that the range is clear when using this tube, as the brass ball is projected with considerable velocity by the powder in the tube. *This Mark will be used up for drill and instructional purposes.*

Mark II tube differs from Mark IV in not having the diagonal holes in the anvil.

Mark I tube is obsolete.

TUBES, VENT-SEALING, PERCUSSION, DRILL.

(Plate XXVII.)

Mark II is of gunmetal and of the same external dimensions as the Service V.S. percussion tube; the body is blackened all over, four longitudinal grooves are cut in the body, and the rim of the head is milled, to distinguish it by sight or touch from other tubes.

Internally it is bored out and fitted with a coned plug of india-rubber, secured in position by a gunmetal plug screwed into the front end.

Mark I differs from Mark II in being much shorter, and in not being blackened, grooved or milled. *No more of this Mark will be made.*

DRILL FOR 4.7-INCH Q.F. GUNS ON TRAVELLING CARRIAGES.

SECTION GUN DRILL.

Battery Gun Drill, which does not vary with the equipment, is given in "Field Artillery Training."

Single detachments should be accustomed to drill as if forming a part of a section, and the instructor should, therefore, always use the orders given for the Section Commander.

The detachment consists of 10 numbers, who fall in two deep, one pace between ranks, **1** on the right of the front rank.

TO TELL OFF.

<i>Section Commander.</i> <hr style="width: 10%; margin: 5px auto;"/>	|	<i>No. 1.</i> <hr style="width: 10%; margin: 5px auto;"/>
"— Section, tell off."	|	

At the order from the Section Commander, **1** numbers **1**, the right-hand man of the rear rank **2**, his front rank man **3**, and so on.

DETACHMENT REAR.

Formed as above, one yard in rear of the muzzle, **1** covering the off wheel.

TO MOVE THE GUN WITH DRAG ROPES.

<i>Section Commander.</i> <hr style="width: 10%; margin: 5px auto;"/>	|	<i>No. 1.</i> <hr style="width: 10%; margin: 5px auto;"/>
"— Section, with drag ropes, prepare to advance."	|	

At the order from the Section Commander, **6** and **7** hand the drag ropes to **2** and **3**; **2** and **3** hook them to the drag washers on their own sides. All available numbers man them on their own sides, the two highest numbers to the shafts.

PREPARE FOR ACTION.

Section Commander.

No. 1.

"—Section, prepare for action."	
---------------------------------	--

At this order **1** will see that the gun and mounting are fit and ready in all respects for action.

He superintends the other numbers, and provides himself with clinometer and tube pocket (which he fills with tubes).

2 examines the breech fittings, brake and spade and provides himself with cartridge extractor.

3 removes the breech sight and muzzle covers, placing them in the limber box, and examines the brake.

4 depresses the gun sufficiently to allow **2** to open the breech, and examines the sights and elevating gear.

1 looks down the bore to see that it is clear. **2** then closes the breech. **4**, after the breech is closed, elevates the gun to the travelling position. **5** and **6** examine the limber box, seeing that the stores there are correct. **7**, **8**, **9**, and **10** see that the ammunition is correct in the wagon and ready for use. **7** issues tubes to **1**.

DUTIES.

1 commands; before leaving the gun park he is to ascertain that the buffer is properly filled; when time fuzes are used, he sees that they are set correctly; he is responsible for the entire service of the gun; he gives only the word of command shown for him, and does not repeat the orders of the section commander; the executive orders given by **1** should not be louder than are necessary for his sub-section to hear.

He measures the difference in level of wheels and orders the necessary correction in deflection.

He tests the clinometer and striker* and sees that the assembling nut on the sheath and the two nuts on the rear end of the needle are tightly screwed up by means of wrench breech mechanism No. 67, and the keep pin in the assembling nut correctly inserted.

2 attends to the breech, brake and spade.

He rams home and assists to traverse.

To open the breech.—He takes hold of the lever with his right hand and draws it towards him as far as it will go.

To close the breech.—He takes hold of the lever and pushes it from him as far as it will go.

3 attends to the brake and spade, uncaps fuzes or removes safety pins and assists to traverse.

4 lays.

5 alternately with **7** brings up a projectile and places it in the bore, and assists **9**.

* To test striker --

(a) For safety push striker forward, and make sure that the point does not project beyond the face of breech screw. If it does, the striker must be adjusted or exchanged.

(b) For efficiency push striker forward, and insert the projecting point of gauge (0.04 inch in length) into the firing hole in front of breech screw; it should touch the firing pin. If it does not, it must be adjusted or the pin exchanged.

6 alternately with **8** brings up a cartridge, places it in the bore and returns the empty case.

7 performs the same duties as **5**.

8 performs the same duties as **6**.

9 fixes fuzes, sets time fuzes when used, and issues projectiles to **5** and **7**.

10 issues cartridges to **6** and **8**.

ACTION.

<i>Section Commander.</i>	<i>No. 1.</i>
" — Section, action rear."	"No. —, prepare to unlimber."
	"Lift."
	"Limber drive on."
	"Lower."
	"No. —, action."

At the order from **1**, "Prepare to unlimber," **2**, **3**, **4**, and **5** stand in to the trail, **2** and **3** nearest the breech. At drill, **8**, **9**, and **10** go to the shafts, **6** and **7** stand ready to push in rear of the limber,* **5** unkeys. **1** then gives "Lift," "Limber drive on," "Lower." The limber moves as detailed in "Field Artillery Training." **1** then gives "Action." **1**, **2**, **3**, **4**, and **5** remove their handspikes and lay them down point to the front and bevel up, as follows:—**1** in rear of the trail, clear of the recoil; **2** and **3** in line with trail handles and one yard clear; **4** and **5** outside of and clear of the wheels.

1 removes the lanyard from the tube pocket, coils it up, and passes the bight round his neck.

4 brings the gun to a convenient position for loading and sets his sight as ordered.

2 drops the spade, opens the breech, places the rammer in a convenient position for use, and, at drill, places the shell extractor outside the rammer.

6 and **7** coil up two dragropes and place them on the ground outside the handspikes.

POSITIONS IN ACTION.

1. Where he can best superintend the working of the detachment.
2. Close to and facing the breech on the right side.
3. In line with the trail eye, covering the left gun wheel.
4. In rear of the sight, facing the front.
- 5, 7, and 9. With the ammunition wagon (shells).
- 6, 8, and 10. With the ammunition wagon (cartridges).

Action Right and Left are the same, except that the trail is moved round a quarter of a circle.

TO FORM DETACHMENT REAR IN ACTION.

<i>Section Commander.</i>	<i>No. 1.</i>
" — Section, detachment rear."	"No. —, double march."

* With Mark I converted carriage, **6** and **7** must assist at the trail, pushing in rear of the limber when the trail is lowered.

On the order from the Section Commander, **1** places himself three yards in rear of, and covering the right gun wheel, and gives the order "Double march"; the numbers double to their places on the left of **1**, each halting as he reaches his place.

TO TAKE POST FROM DETACHMENT REAR IN ACTION.

Section Commander.

No. 1.

"— Section, take post."

"No. —, double march."

At the order from **1**, all the numbers double to their places.

TO LOAD.

Section Commander.

No. 1.

"—Section {
Lyddite
or
Percussion
shrapnel
or
Fuze—"

"No.— {
Lyddite
or
Percussion
shrapnel
or
Fuze—Load"

7 brings up a shell, point to the left; if time fuzes are being used he shows the fuze to **1**; after **3** has uncapped the fuze, or removed the safety pins, he places the shell in the bore, returns, and prepares another shell. (**5** works alternately with **7**.)

2 provides himself with the rammer, rams the shell *hard home*, and replaces the rammer.

6 brings up a cartridge and places it in the chamber, removes empty case from previous round, returns and prepares another cartridge. (**8** works alternately with **6**.)

2 closes the breech, opens it sufficiently to allow **1** to place in the tube, being careful not to work the extractor. **1** puts a tube in the adapter, **2** then *carefully* closes the breech to avoid jarring the tube. **1** will then hook the lanyard.

10 issues cartridges to **6** and **8**.

9 fixes and sets fuzes* and issues shells to **5** and **7**.

TO LAY.

If compensating sights are not used, No. **1** takes the difference of level of wheels and orders the necessary deflection.

When laying over the sights, using tangent elevation.—**4** lays with the elevation and deflection ordered. He elevates himself, and signals to the traversing numbers as required. **2** and **3** pick up their handspikes and place themselves in a line with the trail eye, facing the front, holding their handspikes diagonally across the body ready to traverse.† As soon as **4** signals the gun laid, **2** and **3** lay down their handspikes and take post.

* Time fuzes should be securely clamped to reduce the chances of prematures, caused by the slipping of the time ring.

† When necessary in heavy ground, **6** will make fast the end of a drag rope to the chase and **7** will hook a drag rope to the trail. The cartridge numbers will man the chase rope, and the shell numbers the trail rope, to assist **2** and **3**.

When using quadrant elevation.—**4** lays for direction by the sight (set approximately at the range). **1** then places the clinometer, set at the required elevation, on the clinometer plane, and gives the order "Elevate." **4** elevates or depresses as required, taking care that the last motion is one of depression. As soon as the gun is laid, **1** reports "Ready." When ranging for elevation as soon as the gun is reported "Ready" **1** holds up his hand. If this signal is not seen by his Section Commander he must report "Ready."

TO FIRE.

A gun is not to be fired without the order from **1**, and **1** must never give this order until he sees that the gun is in all respects ready, and, during ranging for elevation, until he has received the order from the Section Commander.

Section Commander.

No. 1.

"No.—, fire."

At the caution from **1**, **2** and **3** step clear of the recoil, **4** cocks the striker, takes hold of the lanyard with his right hand, steps outside the left wheel, and faces the breech. When all the numbers are clear, **1** gives the order "Fire," **4** pulls the lanyard smartly, firing the gun. **1** then unhooks the lanyard, and places it round his neck; **4** depresses the gun, if necessary; **2** opens the breech, and extracts the empty case.

MISSFIRES.

On a missfire occurring, **4** drops the lanyard, and, after 10 seconds, recocks the striker, and again pulls the lanyard. Should the gun again missfire, after a pause of one minute, **1** unbooks the lanyard, and **2** opens the breech. None of the detachment should be directly in rear of the breech when it is opened. **1** examines the tube, and if it has not been struck, he will change the striker. If the tube has been struck, the cartridge will be carefully extracted and placed well clear of the battery. After practice the adapter containing the tube will be carefully unscrewed and the tube then extracted.

When firing blank ammunition—

Should a missfire occur none of the detachment should be directly in rear of the breech when it is opened after the lapse of time as laid down in Section 47, Field Artillery Training (1909 amendments).

TO STAND FAST.

Section Commander.

No. 1.

"— Section, stand fast."

At the order from the Section Commander—

All stand fast, whatever they are doing, except that **4** drops the lanyard and the shell is placed in the bore if a safety pin has been withdrawn.

At the order "Go on" the work is continued.

TO RUN UP.

2 and **3** take their handspikes at the centre, with the hands next the muzzle back up, the other hands at the small ends back down. They use their handspikes as levers under the rear part of the wheels, facing the rear; **4** and **5** man the wheels; **6**, **7**, **8**, **9** and **10** assist, if necessary; **1** applies his handspike under the trail eye. As soon as the gun is sufficiently run up, **1** gives "Halt," when all the numbers remove their handspikes and lay them down.

If necessary, drag ropes will be brought up and hooked by **6** and **7**, and manned by the whole detachment. The command will then be "With drag ropes, run up."

CEASE FIRING.

<u>Section Commander.</u>	<u>No. 1.</u>
"— Section, cease firing."	"No.—, run up." "Halt." "No.—, cease firing."

The gun is run up to clear the spade. **1** then gives "Cease firing"; **2** closes the breech, replaces the rammer and cartridge extractor; **4** elevates the gun to the travelling position, runs his sight down, and replaces the cover; **2** and **3** raise and secure the spade; **1**, **2**, **3**, **4**, and **5** replace their handspikes on the trail.

TO LIMBER UP.

<u>Section Commander.</u>	<u>No. 1.</u>
"— Section, limber up."	"No.—, prepare to limber up." "Lift." "Lower."

At the command, "Prepare to limber up," the numbers stand to the trail as for unlimbering; **5** keys up, and the detachment form detachment rear.

At drill, **6**, **7**, **8**, **9**, and **10** attend to the limber.

TO ASCERTAIN THE LOWEST RANGE AT WHICH THE TRAJECTORY
WILL CLEAR THE CREST, OR OBSTACLE.

Lay the gun on crest with open sight set to a liberal estimate of range to crest or obstacle. The resulting quadrant elevation minus the angle of sight is the elevation due to the lowest range that will allow the trajectory to clear. This range can be read on the range drum.

TO ASCERTAIN WHETHER THE TRAJECTORY WILL CLEAR THE CREST,
THE ANGLE OF SIGHT AND RANGE BEING KNOWN.

Lay gun with the quadrant elevation due to the angle of sight plus range. Set open sight to a liberal estimate of the range to the crest or obstacle. If this line clears the crest the trajectory will do so.

TO REPLACE A DAMAGED WHEEL, 4·7-INCH Q.F., ON TRAVELLING CARRIAGE.

Should a gun wheel be disabled in action, it should immediately be turned so as to bring the sound portion on the ground, the brake put on, and, if necessary, lashed, and notice should be sent to the captain.

The latter will immediately send up one of the spare wheels, which will be brought alongside the damaged one and the wheels changed as follows :—

<i>Section Commander.</i>	<i>No. 1.</i>
"No.—, Change wheels."	"No.—, Change wheels."
	"Lift."
	"Lower."

At this order—

4 and **5** scotch the other wheel with their handspikes and put on the brake.

6 and **7** bring up a lifting jack and hand it to **2** and **3**.

2 and **3** place the jack under the carriage as close as possible to the damaged wheel, **2** placing his handspike on top of the jack to prevent slipping, and lift the carriage until the wheel is clear.

As soon as the wheel is clear, **1** gives "*Lift*," **7** removes the linch pin and dragwasher and places it clear, **4**, **5**, **6** and **7** remove the damaged wheel and run it clear.

The new wheel is put on by the men who brought it up, **7** replacing dragwasher and linch pin, **1** gives "*Lower*"; the carriage is lowered, the lifting jack and handspikes replaced and the detachment resume their places.

The old wheel is taken to the rear by the men who brought up the new one.

Converted Carriage.

Apply jack under rear edge of axletree bed.

Mark I Carriage.

Apply jack under axletree just inside the brake wheel.

On top of jack place point of handspike, small end to the rear.

TO DISMOUNT 4·7-INCH ON MARK I TRAVELLING CARRIAGE BY GYN.

Men required	...	...	...	...	13
Stores—Light gyn, complete	...	...	...	...	1
Dragropes	...	...	...	...	3
Luff tackles	...	...	...	...	2
Selvagees	...	...	...	...	4
Skids, 18" × 5" × 4"	...	...	...	...	1

Place gyn over rear of cradle.

Scotch carriage with handspikes.

Remove breech fittings.

Place the 18-inch skid on its flat crossways inside brackets, as far to rear as possible, resting on bottom of trail.

On each side fix the double block of a luff tackle to a selvagee round a handspike in breech, and single block to a selvagee round axletree inside wheels.

Pass the running ends towards the muzzle, taking a turn round the axletree; take in the slack, and hold on.

Remove piston rod and running-out rods nuts.

Elevate till buffer rests on skid.

Ease off tackles and allow gun to slip back through cradle till front of guide ribs under gun is about 2 inches from end of groove. (It may be necessary to attach a dragrope and haul to start it.)

Sling gun by a dragrope passed three times round gun and hook of gyn tackle.

Work levers so as just to take weight, and make fast.

Place two men to take the slight muzzle preponderance with a handspike.

Ease off tackles and run carriage to front till the bevel on the jacket is just clear of the cradle.

Pass a dragrope twice round the gun in front of this bevel, over hook of tackle in the form of sling, round handspike in breech, and make fast with a reef knot.

(The object of this is to prevent any chance of the gun slipping through the original sling should it get out of the horizontal.)

Cast off side tackles and run carriage forward till muzzle is just short of step in cradle.

Place two men again with handspikes to take the slight muzzle preponderance.

Run carriage clear and lower off on gyn, as required.

To mount the gun is the converse of the above.

For a converted carriage, instead of the 18-inch skid, a 4-foot plank and a large scotch should be used. The plank should be placed with front end resting on front transom, rear end resting on bracket inside rear transom, and the large scotch upside down just in front of projection on under side of buffer.

TO DISMOUNT 4.7-INCH ON MARK I TRAVELLING CARRIAGE BY LIMBER.

Men required	...	...	...	...	20
Stores required—	Dragropes	...	...	...	3
	Handspikes, 6-foot	...	...	...	5
	Luff tackles	...	...	...	2
	Selvagees	...	...	...	4
	Scotches, large	...	...	...	2
	Skids, 18" × 5" × 4"	...	...	...	1
	Planks, 9' × 15" × 3"	...	...	...	2

Remove breech fittings.

Scotch carriage with handspikes.

Place the 18" × 5" × 4" skid on its flat, crossways inside brackets, and as far to rear as possible, resting on bottom of trail.

On each side fix double block of a luff tackle to a selvagee round handspike in breech, and single block to a selvagee round axletree inside wheels.

Pass the running ends to the front, taking a turn round the axle-tree, take in the slack, and hold on.

Elevate till buffer rests firmly on this skid.

Remove piston rod nut and nuts of running-out rods.

Ease off tackles and allow gun to slip back through cradle, till front of guide-rib under gun is about 2 inches from end of groove.

(It may be necessary to attach a dragrope and haul to start it.)

Place a 9-foot plank on each side of gun to receive limber wheels, and run limber on to these till the limber-hook is over handspike.

Scotch limber wheels with handspikes, raise shafts, and lash hook to handspike in breech by dragrope.

Bear down on shafts, ease off tackles, and move limber forward till muzzle is just short of the step in cradle.

Raise shafts and thus lower breech on to ground, and scotch up.

Unslung and run limber back till hook is just over the bevelled slope on the jacket (about 1 foot in front of the C.G.).

Re-sling and run carriage clear.

The gun can now be lowered on to skidding or on to the ground.

If required to travel, the breech should be lashed up to futchels, or shaft; until this is done it is most important that the limber shafts should be carefully attended to, as a dangerous accident might happen if they flew up.

To mount the gun is the converse of the above.

TO SHIFT A 4·7-INCH Q.F. GUN AND CRADLE FROM ONE TRAVELLING CARRIAGE TO ANOTHER BY LIMBER.

Men required	...	...	...	20, i.e., 2 detachments
Stores required—				
Handspikes, 6-feet	...	...	...	5
Scotches, large...	...	...	...	4
Scotches, small	...	...	...	2
Planks, 4-feet	...	...	...	1

Unlimber; remove capsquares, sights, breech fittings and elevating arc.

Back the limber with box removed under the muzzle and run hard back to the gun carriage, with wheels interlocking.

Place a handspike across on the bed of the limber, and to prevent the handspike slipping place a 4-foot plank between the handspike and the footboard of the limber. The limber wheels should be adjusted so that the handspike does not rest on the spokes of the wheel.

On the order "Prepare to bear down" from 1, 2 places a handspike in the bore, which is manned by 2 and 3, 4 places a handspike across that of 2 to 5, 6 one across the chase to 7, 8 one across the chase in front of 6 to 9; the lower numbers of the second detachment take post on the handspikes as detailed for the first detachment, with the exception of 2 and 3, who keep the shafts of the limber on the ground. The wheels of the limber are well scotched

up with large scotches: 2 small scotches are placed ready to scotch up on the handspike under the gun, and attended to by Nos. 10.

The second carriage is now placed conveniently to run into position, in order to reduce to the shortest possible time the period during which the breech is unsupported.

The numbers at the handspikes get as near to the muzzle as possible in order to gain as much leverage as they can.

On the order "Bear down" from No. 1, the muzzle is borne down, and as soon as the weight is on the handspike the small scotches are placed in position.

The shafts of the limber must not be allowed to rise, or the muzzle cannot be sufficiently borne down.

When the cradle is clear of the carriage and the gun quite steady, the carriages are changed by the higher numbers of the second detachment. When the second carriage is in position, 1 gives, "Come up." The gun and the cradle is lowered into the trunnion holes. The fittings are then replaced.

Q.F. 4 7-INCH B GUNS ON TRAVELLING CARRIAGES.

List of Securing Straps.

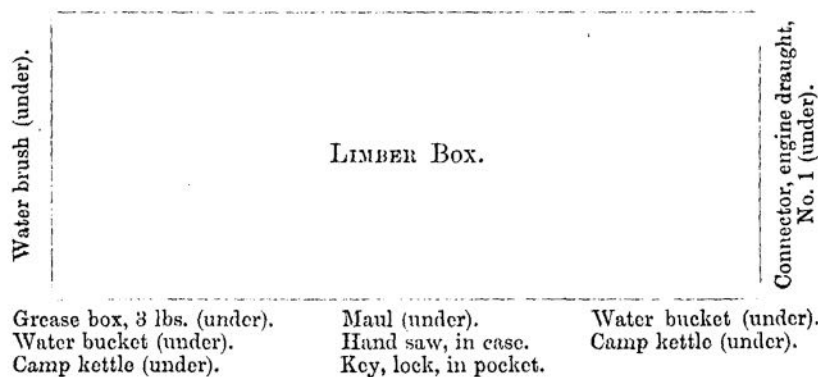
Size in inches.	Service for which required.	Number.		Position of Straps.	
		New.	Con- verted.		
CARRIAGE.					
3 × 10	Aiming posts	2	2	On top, right side.	
13	Rammer	1	1	On left side.	
18	Sighting step	—	1	On left side.	
22	Rammer	1	1	On left side.	
1 ×	Handspikes	1	1	On right side.	
		1	—	On left side.	
		—	2	One on each side.	
		1	—	On right side.	
		1	1	On left side.	
LIMBER.					
1 ×	Handle lifting jack	2	2	On platform board.	
	Billhook	1	1	Under limber, off side.	
	Camp kettles, handles	2	2	Under limber.	
	Connector, engine draught, No. 1... ..	—	1*	Under limber.	
	Props	2	2	On shafts.	
	Water brush	1	1	Under limber, near side.	
	Felling axe	1	1	Under footboard, near side.	
	18	Props	2	2	On frame shafts.
	Swingletrees	—	4	Two under each futchel.	
	Shovels	4	4	On box, front of limber.	
	Pickaxe	1	1		
	Outriggers and stays	2	—	On splinter bar.	
	18	Connector, engine draught, No. 1... ..	—	2*	Under limber.
	Shaft fittings (farmer's draught)	4	4	On shafts.	
	22	Connector, engine draught, No. 1... ..	1*	—	Under limber.
	Outriggers and stays	—	4	On splinter bar.	
	26	Grease Box, 3-lb.	1	1	Under limber.
	30	Maul (head)	2	2	Under limber.
	36	Connector, engine draught,	1*	—	Under limber.
	44	No. 1			
	44	Swingletrees and outrigger stays	2	—	On platform board.
		Camp kettles, lids	2	2	On camp kettles.
48	Drag ropes	2	2	On footboard.	

* When No. 2 Connectors are issued these straps will be returned to store.

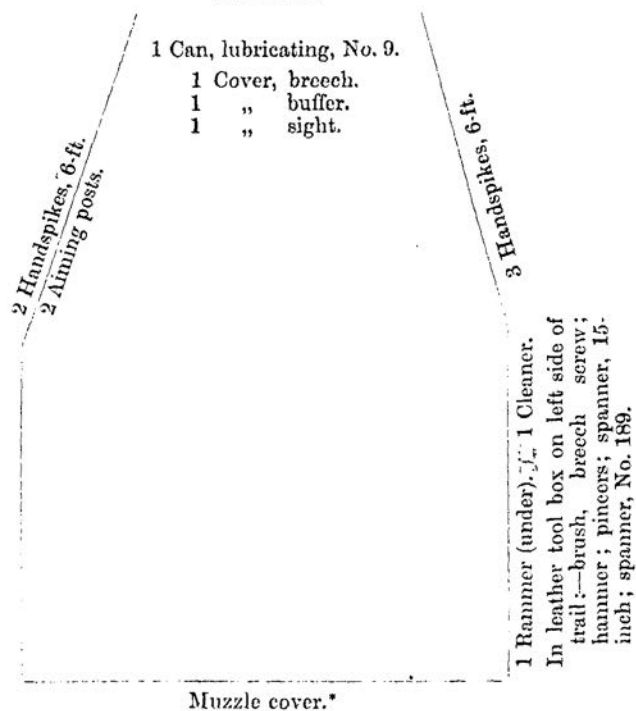
CARRIAGES AND LIMBERS, Q.F., 4.7-INCH B GUN.

LIMBER.

Swingletree. Lifting jack, Clerk's. Pair heavy drag ropes.
 Felling axe (under). Bill hook (under).
 Pickaxe and 2 shovels on box.



CARRIAGE.



* When not on gun.

[illegible]

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.